MILL SECTION of

Concrete

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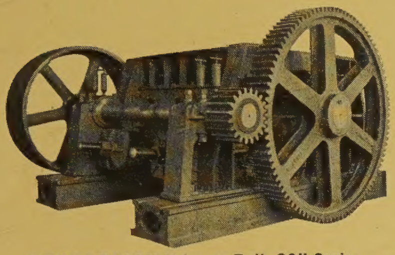

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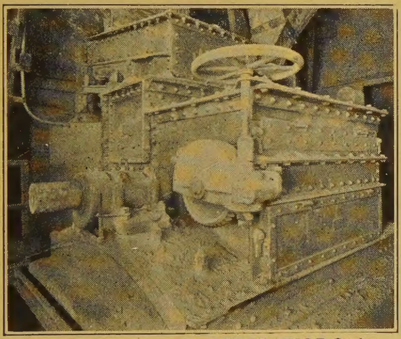

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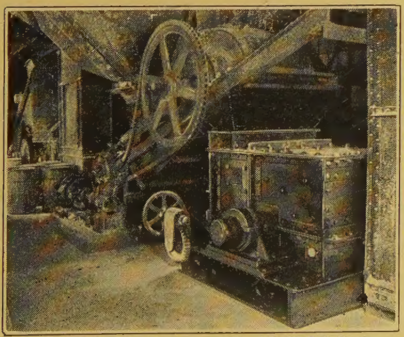

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STEELBUILT CRUSHERS

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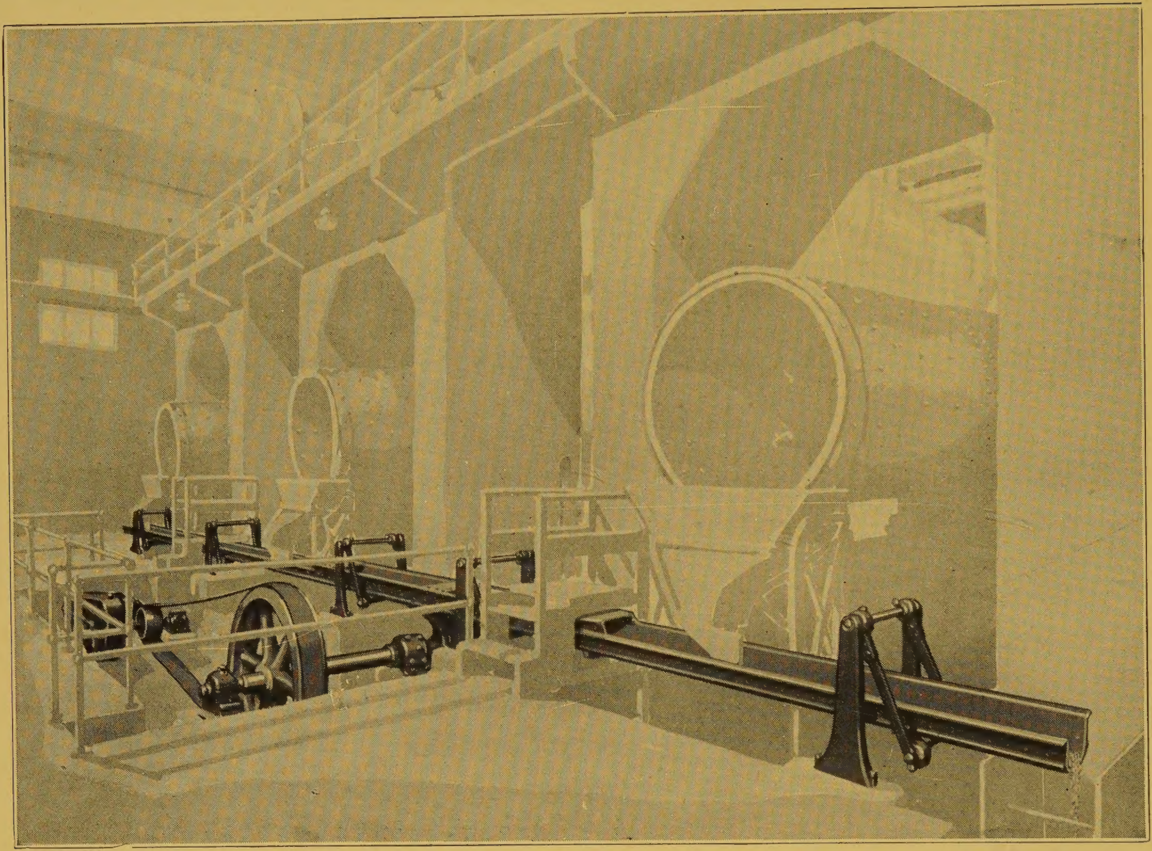
The Skipulter

(Registration Applied for)



A Skipulter installed in a western cement plant, where it is conveying cement clinker, discharged from three coolors, to an elevator

THE Skipulter is an improved type of shaker conveyor for transporting coarse materials, such as cement clinker, coal, ore, slag, rock, limestone, etc.

It consists of a steel trough, suspended by pendulums, actuated through a flywheel and eccentric into an intermittent forward and backward motion. No springs or rollers are employed. The transported material is rapidly and constantly carried forward to point of discharge.

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F. L. Smidth & Co.
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ENGINEERS
50 Church Street
Designers and Equippers of
Cement Making Factories
NEW YORK
Factory, Foundry and Laboratory—Elizabeth, N. J.

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MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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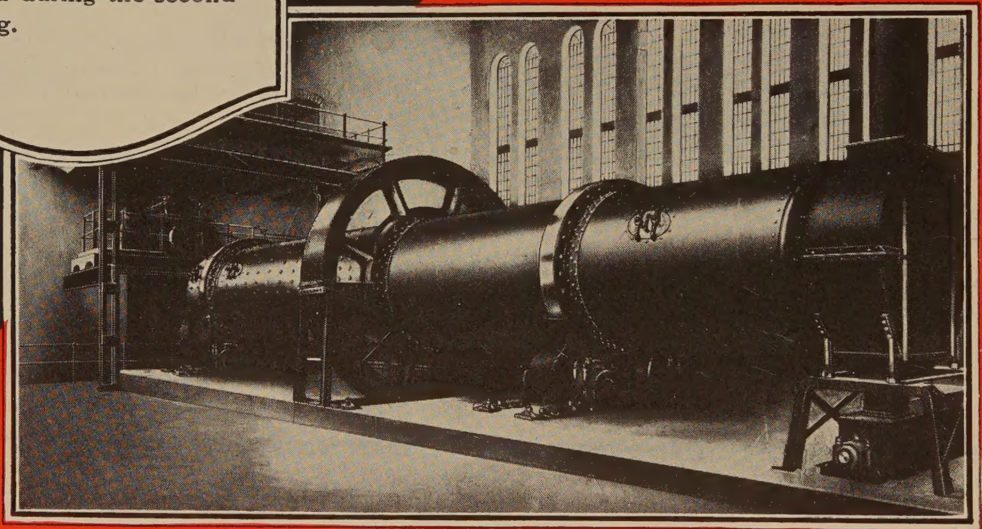

POLYSIUS CORPORATION
BETHLEHEM TRUST BLDG.
BETHLEHEM, PA.

MILL SECTION of

Concrete

Vol. 32 Chicago, March, 1928 No. 3

Does Belgium Need the American Cement Market?

An Authoritative Analysis of the Belgian Cement Industry with Special Reference to Its Need for Export Markets — Marketing Statistics — Exports to America — Other Outlets — Will Shipments to the United States Increase or Decrease in Volume?

Written for CONCRETE by an experienced industrial investigator who, for personal reasons, prefers to remain anonymous

IT is somewhat difficult to separate the artificial portland cement industry from the natural cement industry in Belgium, as trade statistics do not differentiate between the two varieties of cement, and certain Belgian firms produce both varieties at the same time.

Prior to the war, Belgium produced 1,500,000 metric tons of artificial portland cement, and in the neighborhood of 550,000 tons of natural portland cement. Of this total production of slightly over two million tons, nearly half was exported (970,133 tons in 1912). In these prewar years half of the Belgian export went to other European countries, over 25 per cent was shipped to South American countries, and the rest of foreign market was found in Africa (nearly 10 per cent) and other parts of the world. In 1912 the United States took only 1,461 tons of Belgian cement.

Production Increases

After the war this situation changed rapidly. Production of artificial cement increased steadily to reach 2,300,000 tons in 1925 and 2,550,000 tons in 1926, with good prospects of reaching 2,800,000 tons in 1927. This increase in production is largely due to better installations, to an increased number of rotary kilns in operation in old plants, and to the construction of new plants.

Another factor not to be overlooked is the transformation of the natural cement industry over to artificial portland. While the production of artificial portland cement has been increasing, the output of natural cement plants has been falling off considerably, due to the transformation of this industry. According to estimates, the 1926 production of natural cement amounted to only 200,000 tons. While this statement may be considered as accurate, on the other hand at least a small proportion of 2,550,000 tons considered as artificial portland cement production in 1926 is probably either natural cement or insufficiently corrected artificial portland.

Growth of American Market

One of the big factors of the post-war development of the export trade in Belgian cement has been the growing importance of the American market. In 1926 the United States took 370,000 tons of Belgian cement, out of total exports of 1,461,000 tons, or over 25 per cent of the total export. In other words, Belgium increased its exports of cement nearly 500,000 tons since 1912, and the newly developed American market absorbed 370,000 tons of this increase. Belgium has lost trade in South America and other parts of the world, but has made up for this loss by heavier deliveries to other European countries, particularly Holland and Great Britain.

European Markets

Not only the American market is feeling the heavier exports of Belgian cement, but Belgian competition has been causing considerable alarm to other European producers, particularly as the European market has not grown in proportion to the increased output of cement. In Great Britain, Belgian firms are able to lay down cement at prices with which the British mills cannot compete. While Belgian cement manufacturers have been negotiating with British producers, it appears that no steps have been taken to limit Belgian sales in Great Britain.

In Holland the Dutch cement industry is of very secondary importance, but this country has been the scene of exceedingly keen competition between the Belgian and German producers. For well over a year negotiations have been going on between German and Belgian interests, with a view to dividing up the Dutch market on a forty-sixty or fifty-fifty basis which would give satisfaction to both parties, but as yet no solution has been reached. The Belgians feel that due to their low production cost they have a decided advantage over the Germans, while German firms are in such a strong position on their protected home market and make such heavy profits that they are able to undertake the sacrifice of meeting Belgian prices in Holland, in order to secure a large part of this market. The problem is a thorny one, and if the Germans win out and obtain from the Belgians a reduction of Belgian exports to Holland, the result will be heavier Belgian shipments to other parts of the world.

French Problem

The French problem is a much simpler one, as somewhat higher cost of production in France prevents French mills from delivering in Belgium, or from seriously competing with the Belgians on the Dutch and British markets. On the other hand, the French industry is fairly well protected in the home market from Belgian imports by a duty which practically covers the difference in production cost. An agreement has recently been reached between Belgian and French cement manufacturers by which the Belgian plants agree to limit their French deliveries to an amount which is said to be in the neighborhood of 1926 deliveries to the country (104,000 tons.)

Need American Market?

The situation on the American market is well known. Belgian manufacturers feel that they need the American market in order to take care of their excess production, but at the same time do not wish to antagonize the American producers more than necessary. They therefore avoid any semblance of dumping, but nevertheless their prices are so low as to be a serious factor on the American market, in spite of the fact that total Belgian deliveries to the United States amount to only a small fraction of American cement consumption. In the struggle on the part of the Belgians to keep the American market, the Americans appear to be winning out at the present time, and Belgian exports to the American market for the first ten months of 1927 amount to only 183,000 tons compared to 370,000 tons for the year 1926. In Holland and Great Britain, however, the Belgians appear to have the upper hand, with exports to Holland amounting to 323,000 tons for the first ten months of 1927, compared to 341,000 tons for the entire year 1926, while exports to Great Britain have reached 273,000 tons for the first ten months of 1927, compared to only 189,000 tons for the year 1926. The loss of business on the American market is therefore amply compensated for by larger deliveries in Holland and Great Britain.

Future Trend

It is absolutely impossible to forecast the future trend of Belgian exports, as the position of the Belgian manufacturers on certain markets depends largely upon the outcome of negotiations, and it is possible that such obstacles will be put in the way of Belgian sales in certain countries that the local producers will be forced to develop new markets, or increase their sales in some of their present markets.

Exports

The trend of Belgian export trade in cement is brought out in the following table, showing exports to principal countries during 1912, 1926, and the first 10 months of 1927:

Belgian Exports of Portland Cement (Natural and Artificial)

	1912 Metric Tons	1926 Metric Tons	1927 (10 mos.) Metric Tons
Total exports	970,130	1,461,202	1,344,579
EXPORTS TO:			
U. S. A.	1,461	370,467	183,532
European Countries:			
Germany	87,988	10,785	—
France	50,289	104,479	97,224
Luxemburg	27,197	—	—
Great Britain	90,933	189,138	273,566
Holland	179,968	341,141	323,678
Ireland	3,793	8,423	—
Portugal	17,131	3,103	—
Russia	15,457	—	—
Spain	16,334	910	—
Norway	—	7,295	—
Total Europe	486,090	665,274	—
South and Central America			
Argentina	178,376	159,830	117,878
Brazil	67,827	32,377	41,753
Chile	18,191	3,608	—
Mexico	4,018	2,292	—
Peru	7,654	5,760	—
Uruguay	10,693	—	—
Colombia	—	3,327	—
Venezuela	—	7,943	—
Total South and Central America	286,759	205,137	—
Total Africa	91,054	117,404	73,199
Miscellaneous			
Australia	21,468	—	—
Canary Islands	5,339	21,815	23,155
Turkey	17,245	—	—
Syria	—	24,245	25,413
Cuba	2,965	3,286	—
British India	13,819	2,366	—
Dutch Indies	20,909	4,246	—
Canada	—	1,400	—
Oceania	—	7,932	—
French Antilles	—	10,288	—
Total	81,765	75,578	—

(The 1927 figures are of little interest in that only the nine leading importing countries are shown. More complete statistics will be available only after the publication of the annual trade returns.)

Concentrate on Near-by Markets

As far as can be ascertained from available statistical data, the total production of cement in Belgium during 1926 amounted to 2,550,000 tons of artificial portland, and possibly to 200,000 tons of natural cement. This latter figure has been brought still lower since the beginning of 1927. Of these 2,750,000 tons of cement, about 1,460,000 tons were exported, placing the interior consumption of cement at 1,290,000 tons. While large quantities of cement are being consumed in Belgium in the asbestos cement tile industry, and particularly in the building industry, no startling increase in home consumption is to be expected until Belgian authorities turn to the building of concrete roads, and the present outlook in this direction is not encouraging.

Whatever increase in local consumption may be looked forward to will probably be at least compensated for by increased production of the cement plants.

The export trade may therefore be expected to absorb about 1,500,000 tons of Belgian cement annually. The European market outside of Belgium has shown itself capable of taking nearly half this amount, and as long as Belgium does not lose all or part of the Dutch or British or French market, the European outlet will keep Belgian cement from flooding the markets in other parts of the world. However, if Belgium loses any important part of her European market for cement, a drive to secure larger orders in other parts of the world must necessarily result. Belgian cement people, however, do not foresee any radical change in the present situation.

At the present time the only serious set-back suffered by Belgian cement manufacturers has been the loss of a good part of the American market. This loss has not affected the prosperity of local mills, however, and while Belgian producers are eager to retain their American market, their principal efforts for the present are turned toward the European trade.

Sales of Lime in 1927 Below Those of 1926

THE lime sold by producers in the United States in 1927 amounted to 4,337,000 short tons, valued at $38,210,000, according to estimates furnished by lime manufacturers to the United States Bureau of Mines, Department of Commerce. This is a decrease of 5 per cent in quantity and 8 per cent in value as compared with sales in 1926. The sales of hydrated lime, which are included in these figures, amounted to 1,562,000 tons, valued at $14,300,000, a decrease of 3 per cent in quantity and 6 per cent in value. The average unit value of all lime showed a decrease from $9.11 a ton in 1926 to $8.81 in 1927, and that of hydrated lime a decrease from $9.45 a ton in 1926 to $9.15 in 1927.

Conditions in the lime industry during 1927 were reported as unsettled and unsatisfactory, especially for the last six months of the year. Demand for building, chemical, and agricultural lime was irregular, and although in general it was reported as less or the same as in 1926, there were many reports of good or increased demand.

Ohio, the leading state, showed a decrease of 7 per cent in total quantity of sales and 8 per cent in sales of hydrated lime. Pennsylvania, which ranked second, showed a decrease of 2 per cent in total sales. Of the 23 states in which more than 25,000 tons were sold, only 8 showed increased sales.

Sales of lime for building in 1927 are estimated at 2,200,000 tons; for chemical uses, 1,847,000 tons; and for agriculture, 290,000 tons.

Sales of deadburned dolomite for refractory use were estimated at 370,000 tons, valued at $3,316,000, a decrease of 4 per cent in quantity.

The accompanying table compares the estimated sales of lime by the producers in 1927, by states, with the tables in 1926.

LIME SOLD BY THE PRODUCERS IN UNITED STATES IN 1926 AND 1927

	1926			1927 (Estimated)		
	Hydrated Lime	Total Lime		Hydrated Lime	Total Lime	
State	(Short Tons)	(Short Tons)	Value	(Short Tons)	(Short Tons)	Value
Ohio	752,764	1,056,589	$10,348,880	690,000	978,000	$9,445,000
Pennsylvania	237,066	794,196	6,303,312	258,000	780,000	5,800,000
Missouri	83,451	263,467	2,218,943	91,000	274,000	2,295,000
West Virginia	42,164	267,464	1,719,590	36,000	250,000	1,576,000
Alabama	29,791	220,732	1,721,558	26,000	208,000	1,589,000
Wisconsin	15,458	216,414	1,896,772	14,000	196,000	1,680,000
Massachusetts	19,005	202,065	2,653,746	20,400	181,000	2,322,000
Tennessee	52,190	173,363	1,319,303	50,000	176,000	1,261,000
Virginia	62,191	188,696	1,453,095	63,000	172,000	1,250,000
Illinois	26,549	103,180	1,013,740	32,000	117,000	1,130,000
Maine	(a)	128,120	1,615,776	22,000	116,000	1,364,000
Indiana	46,332	126,005	970,624	45,000	107,000	778,000
Michigan	15,468	107,671	995,123	17,000	100,000	942,000
New York	36,193	107,326	1,016,647	36,000	97,000	923,000
Texas	33,443	78,293	706,153	34,000	79,000	709,000
California	9,294	67,421	800,089	(a)	65,000	774,000
Maryland	36,624	63,639	524,242	28,000	58,000	421,000
Vermont	9,731	56,378	677,944	9,600	57,000	557,000
Connecticut	(a)	61,742	695,495	(a)	53,000	602,000
Arizona	(a)	42,757	421,549	(a)	47,000	455,000
Arkansas	(a)	31,346	275,935	(a)	35,000	322,000
Minnesota	(a)	28,522	296,068	(a)	(a)	(a)
Washington	(a)	23,783	298,014	(a)	27,000	320,000
Undistributed	99,097	151,229	1,623,854	90,000	164,000	1,695,000
	1,606,811	4,560,398	$41,566,452	1,562,000	4,337,000	$38,210,000

(a) Included under "Undistributed."

European Mixed Portland Cements

Part II of the Study of Special Portland Cements in Europe—Iron-Portland Cements—Sand Cements—Other Mixed Products—Data on Their Performance—Comparisons

By E. C. BLANC

The present article is made up of three brief sections from "Le Ciment Portland," all relating to portland cement admixtures, rather than to definitively new types of cement. As in the previous article, I am merely supplying a clear and complete translation of these sections, which were written entirely by M. Blanc. Where it is advisable or necessary to add comments of my own, they are enclosed in brackets and signed with my initials. I may note that the matter of Mixed Portlands will not be discussed in the third edition of "Cements, Limes and Plasters," in which the new sections will deal solely and rather extensively with the Alumina Cements and the High Strength Portlands. This article is the second of a series in which translations of certain parts of our book on modern cements will be presented. The first article, on high early strength portland cements in Europe, was published in the January issue.—Edwin C. Eckel.

I. German Iron-Portland Cements

UNDER this name we designate the product made, chiefly in Germany, under the name of Eisen portland cement, by grinding an intimate mixture of portland cement clinker and granulated slag, in proportions around 70 per cent clinker to 30 per cent slag. The clinker which forms the chief component is made either from a normal limestone-clay mix, or from a slag-limestone mix.

The chemical and physical characteristics of the iron-portlands are well exemplified by the tabulation below, representing two brands, both of which are made at the same works at Hagondange. (The brand in the first column evidently contains far more slag than the second, probably around a 50-50 mixture, while the second brand is, say, 75 per cent portland, 25 per cent slag. E. C. E.)

	Brand A	Brand B
Silica	28.8 per cent	25.2 per cent
Alumina	12.9 per cent	9.1 per cent
Iron oxide	2.2 per cent	2.5 per cent
Lime (CaO)	49.5 per cent	56.6 per cent
Magnesia	3.4 per cent	2.6 per cent
Sulph. trioxid	0.6 per cent	1.1 per cent
Loss	2.1 per cent	2.2 per cent
Residue, 900 mesh	1.3 per cent	1.7 per cent
Residue, 4900 mesh	12.9 per cent	13.5 per cent
Set begins	4 hr., 30 min.	5 hrs.
Set ends	13 hr., 30 min.	8 hrs.
Tensile, 1:3 mortar		
7 days	22.7 kgs	18 kgs
28 days	28 kgs	28 kgs
Compression, 1:3		
7 days	131 kgs	160 kgs
28 days	228 kgs	257 kgs

(Mixed cements of this type are essentially slag cements in which the slag is mixed with portland cement instead of with slaked lime, as is usually the practice in making slag cement. Or, viewed from another standpoint, we may consider them silica cements in which a puzzolanic component (slag) is used instead of the ordinary inert sand. That brings us naturally to the studies made by Feret at Boulogne, which Blanc next discusses. E. C. E.)

The iron-portlands do not differ greatly in qualities from normal portlands, and in Germany the Union of German Cement Manufacturers admits them on a footing of equality. In most other countries, particularly in France, such products are considered simply as adulterated portlands and cannot be sold as anything else. It must be noted, however, that a few works in eastern France, formerly in German Lorraine, continue to make and sell iron-portland cements.

II. The Work of Feret on Sand-Cements and Allied Mixed Products

At the outset of his recent investigations of mixed cements, M. Feret summarized the principal points which it was necessary to verify by experiment:

1. Does the size and sizing of the sand used in sand-cement affect strength?
2. Is the increased strength used in sand-cement due merely to increased fineness with which both components are ground?
3. Does the sand, by its prolonged and intimate grinding with the cement, acquire more active puzzolanic properties?
4. Does the increased fineness bring with it any technical difficulties?
5. Does the increased water necessary bring about a porous mortar, and by consequence, one less resistant to sea water?
6. Are there other materials of higher value than ordinary sand?

Numerous tests were made by M. Feret to secure answers to this list of questions, and his results have been summarized in a communication published in January

1925 by the Franco-Belgian Association for Testing of Materials, while the entire work has since been published in detail in the *Revue des Materiaux de Construction.* (1925-1926.) Briefly stated, Feret's conclusions were as follows:

Grinding Increases Strength

For an equal quantity of pure cement, the simultaneous grinding employed in these mixtures does increase the strength at short periods, in tensile, compressive and flexure tests. The gains tend to decrease and finally to disappear at longer periods.

In sea water sand-cements acted more poorly than ordinary cements. (In the ten-year period ordinary portland cement only ran fourth, and at two years it was showing not much over a third the strength of alumina cement. E. C. E.)

Porosity increases as the percentage of pure cement in the sand-cement diminishes. Compressive strength varies, directly with the amount of pure cement in the compound. Tensile and flexure tests, on the contrary, show as good results with 50 per cent cement, and 50 per cent silica as with any higher amount of cement.

Thorough Mixing

Ordinary sand remains inert, regardless of the fine grinding. The importance of the simultaneous grinding seems to be merely that it insures a thorough and homogeneous mixture of the two constituents.

In order to test the possible effects of composition of the added component, various other very finely ground materials were employed, as follows: pure silica from quartzite; gaize (siliceous mineral deposit, differing from diatomaceous earth chiefly in that the original silica came from sponge spicules instead of from diatoms); powdered limestone; powdered brick; slaked lime; hydraulic lime.

Of these, the slaked lime gave greatest porosity and lowest strengths. For the others, the silica powder and the hydraulic lime gave slightly better results at very early periods, but the longer tests showed marked superiority on the part of the puzzolanic materials, i. e., gaize and powdered brick.

Intact

At the end of the fifteen years over which period Feret's tests had then extended, the mixed-portland mortars made with powdered brick, with gaize, and with powdered quartzite were still intact; while those made with powdered limestone, with hydraulic lime and with slaked lime were more or less fissured.

(Feret's results confirm, by long time tests, suggestions made some twenty years ago, that if there were any basis whatever for the original claims of the sand-cement patentees, the results should show much more strikingly if a puzzolanic material were employed in place of either ordinary sand or limestone. Such materials are slag, volcanic ash, tuffs, brick dust, and certain natural or artificial materials which supply silica in more or less soluble form —i. e., diatomaceous and similar earths, silica-gel, glaucosil [the silica residue from greensand treatment]. This fact is the soundest basis, perhaps, as a clew to the direction in which economically sound mixed cements, whether mixed portlands or mixed naturals, are most likely to be developed commercially. As a matter of direct interest in the present connection I am adding a table giving analyses of various natural and artificial materials of the general types suggested above for possible utilization in making mixed cements. E. C. E.)

Analyses of Materials Suitable for Mixed Cements

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Silica	88.78	77.78	81.53	87.07	31.81	34.30	48.94	72.84	22.16
Alumina	2.68	2.96	3.43	1.01	14.80	14.76	18.95	12.26	15.58
Iron oxid	tr	tr	3.34	0.42	......	......	12.34	4.35	6.30
Titania	0.10	......	......	......	......	......	......	......	40.81
Lime	1.61	0.88	2.61	n.d.	49.74	48.11	5.41	2.55	9.51
Magnesia	1.30	0.37	n.d.	n.d.	2.29	2.66	2.42	1.58	5.34
Water, etc.	5.54	17.03	6.04	8.42	......	......	11.94	2.25	......

1 and 2. Diatomaceous earth, two California localities.
3. Diatomaceous earth, Maryland.
4. Glaucosil, Delaware.
5 and 6. Blast furnace slags, South Chicago, Ill.
7. Trass, Andernach, Germany.
8. Volcanic ash, Santorin, Greece.
9. Black furnace slag, New Jersey.

III. Bied's Comparisons of Sand-Cements and Ordinary Mortars

A final short table, bearing on the same subject, is presented below as published by Jules Biedin in the *Revue des l'Ingenieur.*

Compressive Strengths of Sand-Cements and Mortars

Mixture, kilogrammes		Compression, kg per square centimetre		
		28 days	3 months	6 months
A. Cement	250 kg	265 kg	344 kg	370 kg
Sand	750 kg	......	......	......
B. Cement	187 kg	......	......	......
Powdered silica	63 kg	253 kg	340 kg	400 kg
Sand	750 kg	......	......	......
C. Cement	125 kg	......	......	......
Powdered silica	125 kg	......	......	......
Sand	750 kg	125 kg	170 kg	210 kg
D. Cement	187 kg	......	......	......
Sand	750 kg	135 kg	176 kg	235 kg
E. Cement	125 kg	......	......	......
Sand	750 kg	0	0	25 kg

In this table A, D and E are normal mortars, made by *mixing* cement and sand, while in B and C a portion of the sand was ground up with the cement, making a sand-cement. The economies possible through this procedure are suggested by the compressive strengths attained at different periods.

Atlantic Shippers' Board Shows Rise in 1927 Cement Shipped

A report from the Atlantic States Shippers' Advisory Board states in its territory, cement shipments up to December, 1927, exceeded those of 1926 for the same period by 3,000,000 barrels. It is estimated that for the first quarter of 1928 cement shipments in the Atlantic territory will be 5 per cent greater than in 1927.

New Books

MODERN BLASTING IN QUARRIES AND OPEN PITS, by J. Barab. Published by Hercules Powder Co.

This book not only contains a thorough treatise on the general principles of modern blasting practice, but also detailed instructions for the use of explosives in the various types of work most commonly encountered. Included is a discussion of the problems connected with the quarry work done by cement mills and an analysis of the different strata found in the various localities where cement mills are in operation. It is well illustrated with plans and diagrams which show clearly the practical application of the various types of blasting discussed in the text.

The book itself is beautifully printed on a good quality of paper, and sturdily bound.

Gain in Strength of High Strength Portland Cements Cured in Air and in Water*

A Discussion of Some of the Differences in Character, Manufacture and Behavior Between High Early Strength Portland Cements and Ordinary Portland Cements

By DR. HAEGERMANN

EVERY new cement should be subjected to tests extending over a period of several years to protect the cement users from unexpected phenomena developing in the field. This is also true of high strength portland cement although it is not a new product, but a special quality portland cement.

Portland cement has proven its worth as a hydraulic cement and there is no reason why the improved product manufactured with great care should not show the same properties. However, doubts on this subject are voiced from time to time, the high lime content and greater fineness of this cement being questioned.

The correct lime content of a cement does not depend on the absolute lime content. It is well known that silica (SiO_2) reacts with lime (CaO) more readily than either alumina (Al_2O_3) or iron oxide (Fe_2O_3). This cannot be illustrated numerically as these reactions are influenced not only by the chemical composition, but by the physical properties of the raw mix and the temperature of calcination. Thus silica present in the form of sand reacts less readily than its compound with alumina, the aluminosilicate. With regard to temperature of calcination, it is sufficient to point to tests of fused portland cement, which have always shown that fused portland cement permits the maintenance of a lime content higher by a few per cent than that of sintered portland cement. Thus the limit of unsoundness of cements varies greatly, being determined by the quantities of other compounds present, by the physical properties of the raw materials, by the method of manufacture used, by the temperature of calcination and not by the absolute lime content. It cannot be said that all cements become unsound when the lime content reaches a certain height, such as 67 per cent CaO. A portland cement with 63 per cent CaO may be high in lime, while one with 64 per cent CaO may be relatively low in lime. (Compare the relative and absolute moisture of the air.)

The above must be kept in mind when making statements about high-lime and low-lime portland cements and about "running up the lime content to the limit of soundness." It gives the reason why high strength portland cements with relatively high percentages of lime are perfectly sound and frequently show better resistance to aggressive solutions. Greater fineness of the raw materials and higher temperature of calcination alone justify a higher lime content.

Clinker Is Ground Finer

High strength portland cement differs further from ordinary portland cement in that its clinker is ground finer. This also has been commented upon. This is a peculiar situation, as all specifications prescribe maximum amounts retained on certain sieves, guarding against coarse grinding. In spite of this, fineness is being questioned apparently without any reason. The cement user knows that greater fineness is beneficial to the soundness. Yet the contrary is claimed by Mr. Gensbaur in his article in the *Czech Ingenieur-Zeitschrift*, No. 19, 1927.

Mr. Gensbaur caused a certain confusion in the circle of cement consumers with his statements that "the chase after maximum compressive strength"—"by running up the lime content and increasing the fineness, results in 'concealed' unsoundness of cements now appearing on the market." He tries to prove it by quoting the results of his own curing method, KL-curing, which consists in following up the ordinary 28 days of combined air and water curing (1 day in air, 6 days in water, remainder in air) by a further period of 28 days water curing. It appears that the majority of cements tested after 56 days KL-curing yield lower strength values than after 28 days of combined air and water curing. The test results quoted show that cements which failed under standard (combined) curing conditions, were satisfactory with KL-curing.

Drop of Strength

Mr. Gensbaur's assumption that the higher lime percentage and greater fineness are the causes of this retrogression, is erroneous. A drop in the strength of dry specimens, again immersed in water, should not be surprising—it is a phenomenon entirely apart from the soundness of a cement, which can be observed on all cements, whether high or low in lime, and on practically all natural rocks. Sedimentary rocks, such as dense limestone and sandstone, in a water saturated condition have strength values 50 per cent lower than when dry on account of the softening of the cementing mass. Even crystalline rocks, such as clay-free marble and fresh granite, in which no such softening can occur, show a drop of strength when immersed in water, that amounts to about one tenth of the strength when dry, according to Hirschwald.

Due to the softening, the mortar of all cements experiences a loss in strength, which is followed by a subsequent rise due to resumed chemical activity. The testing procedure should take account of these facts, if "concealed" unsoundness of cements is to be recognized, as otherwise the conclusions drawn will contradict practical evidence.

Strength Trends of Special Cements

The trend of the strength curves of high strength port-

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*Translated from *Tonindustrie-Zeitung*, p. 119, 1928.

land cements has been determined over a period of several years in tests carried out at Karlshorst, using air and water curing. These tests prove the soundness of cements in air and water and justify the assumption that these cements are in no way lagging behind ordinary portland cements. The results of tension and compression tests will be considered separately; those of ordinary portland cement will be given first and will be followed by those of high strength portland to facilitate comparison.

TABLE I

Compressive Strength of Ordinary Portland Cements cured in water up to 2 years, according to Framm (Proc. 1913, p. 379, Vol. 1-5)

1:3 standard sand mortar

Ordinary Portland Cement	Comp. strength in lbs. per sq. in. for water curing 7 days	28 days	3 mos.	6 mos.	12 mos.	2 yrs.
No. 1	2986	5546	7110	7480	7679	7992
No. 2	3015	4835	6399	7110	6982	7337
No. 3	3527	4678	5901	6143	6584	6811
No. 4	3399	4721	5915	6456	6754	7380
No. 5	3640	4550	5915	6484	6868	7394
Average	3313	4863	6257	6740	6968	7380

TABLE II

Compressive Strength of Ordinary Portland Cements cured in water up to 10 years, according to Burchartz (Handbuch f. Eisenbeton, 4th Edition, Berlin, Wilhelm Ernst & Sohn, Publishers)

1:3 standard sand mortar

	Compressive strength in lbs. per sq. in. for water curing 7 days	28 days	6 mos.	12 mos.	2 yrs.	5 yrs.	10 yrs.
Average from tests of 5 different cem'ts	3029	4351	6044	6399	6371	7295	7252

Comparison of Strength Gains

The tables and the diagram show that the gain in strength of ordinary and high strength portland cements is similar, the phenomena observed in the former being repeated in the case of the latter. Thus a continuous rise is to be noted up to one year, at which time a standstill sets in, manifested in some cements by a very slight gain and in others by a loss, both values being less than the allowable error of adjustment. The test results prove convincingly that the compressive strength of high strength cements is not approached by ordinary cements even at ages of 10 years; this is shown in Tables II and IV. When cured in water, high strength portland cements at 28 days acquire the strength developed by ordinary cements after 10 years.

The same variations occurring in ordinary portland cements, are encountered in high strength portland cements, as for example, the standstill or even slight drop of compressive strength between 1 and 2 year curing and the subsequent rise for longer periods of curing. High strength portland cement No. 10 shows a slight loss in strength between 1 and 2 years, which lies within the range of allowable error; further gain is noted after 3 years, as shown in Table V.

TABLE V

1:3 standard sand mortar

	Compressive and Tensile Strength in lbs. per sq. in. after water curing for periods of 1 year	2 years	3 years
High Strength Portland Cement No. 10	9214 526	9086 513	9584 523

Comparing the absolute gain in strength from 7 days to 2 years water curing, one comes to the conclusion that it is constant for all age groups, when based on the average values within the error limits of the testing procedure.

Table VI gives the difference between the average strength values of Tables I and II, i.e. of ordinary portland cements, and those of Table IV, i.e. of high strength portland cements grouped according to age.

TABLE III

Tensile and Compressive Strength of High Strength Portland Cements cured in water up to 2 years

1:3 standard sand mortar

Tensile and compressive strength in lbs. per sq. in. when cured in water for

High Strength Portland Cement	2 days	3 days	7 days	28 days	3 months	6 months	12 months	2 years	28-day combined curing (1 day air, 6 days water, rem. in air)
No. 1	3655 373	4209 404	5915 447	6897 508	8575 471	8717 549	9655 502	9741 534	8020 597
No. 2	3299 387	4294 444	6115 516	8504 544	9016 600	9826 603	10124 548	10352 640	9385 667
No. 3	3356 370	4039 416	6158 473	7479 522	8348 542	8759 554	8887 498	9201 495	8418 623
No. 4	3641 415	4195 438	5702 488	6940 582	7580 572	8930 622	9912 622	9997 562	7921 697
No. 5	2218 299	3569 430	5461 519	7086 582	8560 596	------- -------	9670 580	10617 603	8461 664
No. 6	3427 397	4364 437	5731 495	7086 502	8844 533	8930 547	9485 528	9428 540	8133 580
No. 7	3684 376	4322 394	5148 434	6285 492	7394 504	7920 504	8461 498	8133 527	7323 667
No. 8	3996 402	4350 430	5546 442	6442 513	7508 579	8404 591	8575 563	8632 561	7351 551
No. 9	2303 280	3740 374	4963 492	7224 563	7820 580	8987 573	------- -------	9144 597	8319 687
No. 10	2787 345	3669 384	4935 437	6427 477	7905 519	9001 542	9215 527	9087 513	7380 551
No. 11	4479 431	5361 468	7025 523	9030 583	9897 608	10878 622	11077 589	10637 630	9926 628
No. 12	4778 402	5631 459	7025 485	8162 530	------- -------	------- -------	9385 534	9257 523	9357 591

TABLE IV

1:3 standard sand mortar

Average of High Strength Portland Cements	Compressive strength in lbs. per sq. in. when cured in water 2 days	3 days	7 days	28 days	3 months	6 months	12 months	2 years
Nos. 1-12 of Table III	3470	4309	5802	7295	8319	9030	9499	9527

TABLE VI

Difference in Compressive Strength in lbs. per sq. in. between the average values of high strength portland cement and the average values of:

	Cured in water for					
	7 days	28 days	3 mos.	6 mos.	12 mos.	2 yrs.
(a) Ordinary portland cement in Table I	2489	2432	2773	2289	2532	2147
(b) Ordinary portland cement in Table II	2773	2944	———	2986	3100	3157

The absolute difference of compressive strength noted at 7 days between different portland cements is maintained even in the highest age groups, when average values are the only ones considered. Discrepancies are noted in the case of individual cements.

Table VII gives the gain in strength of two other high strength cements, namely of an alumina cement(Alcement made by Lafarge) and of a high strength portland cement of special manufacture.

TABLE VII

1:3 standard sand mortar

	Compressive and tensile strength in lbs. per sq. in. when cured in water for									Combined air and water cur., 28 days
	1 day	2 days	3 days	7 days	28 days	3 months	6 months	12 months	2 years	
Alumina cement	6029	6427	7252	7465	9286	9911	10025	9826	9712	10580
	374	351	404	444	401	417	465	508	550	589
High strength portland cement	4280	6171	7593	8902	9826	10494	10181	10324	10167	11262
	375	419	461	505	494	494	526	541	536	651

Both cements in Table VII are characterized by high early strength as early as at 24 hours. They are, therefore, in a class apart from those in Table III. The standstill or flattening out of compressive strength occurs with these cements at 3 months. Their tensile strength shows a drop as early as at 7 days, after which it continues to rise. For example, the tensile strength of alumina cement at 3 years rises to 588 lbs. per square inch, while the compressive strength drops to 9243 lbs. per square inch.

Tensile Strength

The trend of the tensile strength differs from that of compressive strength in all tests made thus far. The values for high strength portland cement are given in Table III. Table VIII gives the tensile strength of ordinary portland cements (according to Framm).

TABLE VIII

1:3 standard sand mortar

	Tensile strength, lbs. per sq. in. when cured in water					
Portland Cement	7 days	28 days	3 mos.	6 mos.	12 mos.	2 yrs.
No. 1	311	378	469	479	501	469
No. 2	341	414	490	533	517	539
No. 3	310	320	378	436	400	520
No. 4	311	360	417	483	448	526
No. 5	347	431	476	490	498	494
Average	324	381	447	485	472	510

Professor Burchartz' results of tensile strength are given in Table IX. The values are averages of tests of five different cements. No relapse in strength is recorded, which may be the result of the compensating effect of individual values.

TABLE IX

1:3 standard sand mortar

	Tensile strength in lbs. per sq. in. when cured in water						
	7 days	28 days	6 mos.	12 mos.	2 yrs.	5 yrs.	10 yrs.
Average of 5 cements	256	354	438	446	495	542	577

The average values of tensile strength of 12 high strength portland cements are given in Table X.

The difference is greatest during the first days of hardening; the more advanced age groups show a convergence, which, however, is not completed at the age of 2 years. The tensile strength values of high strength portland cement are still on the average 10 per cent higher than those of ordinary portland cement. All cements show a temporary flattening out or decline of strength. These variations are independent from the trend of the compressive strength curves. The average curves do not give an exact idea of the time of appearance of these, due to the compensating effect of individual values. Considering the individual cements, one comes to the conclusion that they occur earlier the higher the initial strength in tension. This variation falls within the period of standard tests for portland cements with tensile strength higher than about 455 lbs. per square inch at 3 days or higher than 498 lbs. per square inch at 7 days. In alumina cements it is produced at lower values. This is illustrated by the two cements in Table VII, whose tensile strength drops between 7 and 28 days but resumes its upward trend at later ages.

Fineness of Cement

The effect of fineness of cement on tensile strength is illustrated by the following test:

A commercial portland cement, which, as delivered left 18 per cent retained on the 4900-mesh sieve, was pulverized in the laboratory, until the residue on the 10,000-mesh sieve was only 2.4 per cent.

The analysis of this cement was as follows:

Insoluble residue	0.40 per cent
Silica (SiO_2)	21.26 per cent
Alumina (Al_2O_3)	5.68 per cent
Iron oxide (Fe_2O_3)	3.28 per cent
Lime (CaO)	63.94 per cent
Magnesia (MgO)	1.57 per cent
Sulfuric anhydride (SO_3)	1.57 per cent
Loss on ignition	1.68 per cent
Remainder	0.62 per cent
	100.00 per cent
Hydraulic modulus	2.08 per cent
Silica modulus	2.37 per cent

Soundness: Cement passed the cold water test as well as the accelerated tests (boiling, ball and drying test).

Time of Set:	A. Ground coarse	B. Ground fine
Initial	4h. 45m.	2h. 30m.
Final	8h. 30m.	4h. 30m.

Strength:	A. 18.2 per cent retained on 4,900-mesh sieve		B. 2.5 per cent retained on 10,000-mesh sieve	
	Compression	Tension	Compression	Tension
After 3d. water cur.	3313	340	6328	486
After 7d. water cur.	4934	391	7380	479
After 28d. water cur.	7124	506	8504	519
After 28d. comb. cur.	7920	626	9769	634

TABLE X

1:3 standard sand mortar

	Tensile strength in lbs. per sq. in., when cured in water							
	2days	3 days	7 days	28 days	3 mos.	6 mos.	12 mos.	2 yrs.
Average values of 12 different high strength port. cements in Table III	372	400	478	533	554	563	545	560

Greater fineness results in a considerable increase in the strength values; the tensile strength rises after 3 days from 340 to 486, the compressive strength at the same age from 3313 to 6328. While the coarsely ground cement shows a uniform increase of tensile strength over the period of 3-7-28 days, a drop in strength of the fine cement takes place after 7 days, followed by a further increase at 28 days.

In both cases the cement used was the same unquestionably sound cement.

Further increase indicates that the cause is not to be looked for in unsoundness of the cement, but in physical phenomena. This condition must be taken into account when evaluating the results of standard tests.

Behavior During Air Curing

The behavior of high strength portland cements when cured in air was tested on specimens made of different cements and cured 1 day in damp air, remainder under room temperature and moisture conditions. This method of curing is not rational, as keeping a mortar moist during the first days of hardening has a considerable effect on strength. These unfavorable conditions were selected because it was desired to obtain data on the behavior of high strength cement in such cases. The test values are given in Table XI.

TABLE XI

Compressive and Tensile Strength in lbs. per sq. in. when cured in air (1 day in damp air, remainder at room conditions) 1:3 standard sand mortar

	Air cured for					Combined curing
	3 da.	3 mo.	6 mo.	12mo.	2 yr.	28 da.
High Strength	6897	7522	7181	8304	8432	11262
Portland Cement No. 1 (See Table VI)	388	416	415	634	721	651
High Strength	......	5731	5773	7068	......	8020
Portland Cement No. 2 (See Table VI)	......	428	427	647	......	658
High Strength	......	6015	6470	7280	7721	8219
Portland Cement No. 3 (See Table VI)	......	502	478	647	773	698
High Strength	......	5759	5958	6854	......	8731
Portland Cement No. 4 (See Table VI)	......	421	458	570	......	588

Further tests have shown that the difference resulting from curing 1 day in damp air, 1 day in water and 1 day in damp air, 1 day at room conditons is inappreciable, yet at 3 days (1 + 2 water or air) water curing results in 10 per cent higher values of compressive and tensile strength. This difference increases with increasing age. The compressive strength of air cured specimens in all cases remains below that of water cured specimens, while the tensile strength of the former reaches that of the latter only after 8 months.

The compressive strength of specimens cured in air only increases up to 28 days, then undergoes a decline or standstill and resumes an upward trend only after 6 months.

The tensile strength values remain nearly constant from 2 to 3 days until about 6 months, at which time a marked increase is noted, resulting in considerably higher values than those of water cured specimens.

A more ready increase of tensile than of compressive strength is a phenomenon familiar in ordinary portland cements; the same tendency is shown by high strength portland cements. Table XII gives the compressive and tensile strengths for combined curing of 5 portland cements, whose strength for water curing are given in Tables I and VIII.

Combined Curing Increases Strength

The compressive strength is higher after combined curing of 28 days than after water curing at the same age, yet after about 3 to 4 months the strength of water cured specimens rises considerably above that of specimens cured according to standards. The water cured specimens show a flattening out of the curve at 1 to 2 years, a further rise in strength of 10 per cent being noticeable only at 5 years, whereupon the values remain practically constant up to 10 years. Combined curing results in an increase of the 28-day compressive strength by only 10 per cent at 1 year, yet a marked gain is noted at later ages, the values of compressive strength approaching those for water curing at the age of 5 years, and exceeding the latter at more advanced ages.

Air curing alone (1 day in damp air, remainder at room conditions) results—up to 2 years—in compressive and tensile strengths considerably lower than those for combined curing. Compared to water cured specimens, the above remain below in compression, while the tensile strengths remain lower only up to 9 months, whereupon they become higher than those for water curing.

The difference in strength resulting from air and combined curing is best shown by tabulating the values obtained after 28 days combined curing and 1 year's air curing.

After 28 days combined curing		After 1 year air curing	
Compression	Tension	Compression	Tension
11262	651	8305	634
8020	658	7068	647
8731	589	6854	570

These figures show the important effect of keeping mortar and concrete moist during the first days of hardening.

Summary

In the foregoing are given test results of high strength portland cements cured in water and air up to ages of 2 and 3 years. These results are compared with the cor-

(Continued on page 122)

TABLE XII

Compressive and Tensile Strengths for combined curing (1 day in damp air, 6 days in water, remainder in air) 1:3 standard sand mortar

Portland Cement	Compressive and tensile strength in lbs. per sq. in. after								
	28 days	2 months	3 months	4 months	5 months	6 months	9 months	12 months	2 years
No. 1	5646	5603	5475	4778	5517	5982	5916	5631	6000
	556	529	487	465	478	570	619	641	873
No. 2	5702	6100	6442	6271	6499	6384	6683	6711	7053
	553	531	526	543	547	581	629	704	.....
No. 3	5702	5733	6243	6035	6584	6584	6612	6470	7011
	544	496	493	567	557	595	679	671	867
No. 4	5489	5787	6157	6129	6484	6257	6527	6498	6968
	547	535	544	572	627	682	711	679	867
No. 5	5446	5801	6115	6001	6285	6356	6158	5716	6498
	587	577	584	557	613	654	640	634	843
Average compression	5603	5816	6087	5844	6271	6328	6384	6200	6711
Average tension	564	535	528	542	564	619	654	662	867

Progress Universal in British Cement Industry in 1927

An Analysis of the British Cement Industry's Progress During the Past Year—Volume of Production Grows—Special Cements Make Notable Gains—New Plants—Combines

By A. C. BLACKALL

DURING 1927 the portland cement manufacturing, merchandising and distributing industry in the United Kingdom was fortunately untroubled by industrial disputes and strikes. Those concerned in all departments of the industry were, therefore, able to proceed with the development of plans for improving manufacturing processess, increasing production wherever necessary, and establishing or extending organizations designed to facilitate the distribution of cement to users in all parts of the country.

The cement industry's importance to the community cannot be over-estimated. All the necessary raw materials are furnished, in one form or another, by the native soil, the coal used in the conversion of the materials into cement is a domestic product, and domestic labor is an all-important factor throughout all the stages of the industry. It is conservatively calculated that over 2,500,000 long tons of coal are consumed by the cement industry every year, a quantity involving an important contribution to the wages bill of the coal miners. Moreover, general labor liberally shares in the prosperity of the cement industry, the participation of the workers directly and indirectly amounting to about £1 ($5.00) per ton of cement and representing in the aggregate over £5,000,000 ($25,000,000) per annum. The coal strike of 1926 gave foreign manufacturers a very favorable opportunity to extend the sale of their products in Britain, and as a result the foreign imports of cement—largely Belgian, amounted in 1927 to a total of over 400,000 tons. As in America, there is now in Britain a feeling that the importation of cement from abroad should be combated by a protective tariff.

Sales Volume Grows

While the experiences of individual makers in different parts of the country varied somewhat with local conditions, undoubtedly sales generally increased, and the leading firms confidently anticipate a steadily increasing demand throughout the present year. Statistics so far available indicate that the consumption of all varieties and brands of portland cement in Great Britain was some 5,300,000 tons in 1927—an increase of approximately 300,000 tons in comparison with the figures for 1926. This increase is not a sensational one, but it is welcome as an indication of steady movement forward.

An increased export trade and the re-establishment of business relations with many foreign markets which were lost when Britain ceased to occupy the position of the premier seat of the world's portland cement industry, were among other encouraging features of last year's operations. The quality and reputation of the cement produced are largely responsible for this development, and another reason probably lies in the moderate prices ruling, due to more scientific works management. Yet another important reason is the introduction of rapid-hardening cements, originally produced in Britain and costing very little more than ordinary portland cement of the highest grade. By taking the initiative in the production and marketing of rapid-hardening cement British manufacturers scored heavily over their continental competitors. As a result this material is being extensively exported to the Continent, New Zealand, Central Africa, South America and other distant countries.

Early Strength Cements

Originally introduced about three years ago by the Associated Portland Cement Manufacturers, rapid-hardening cements are now being made under different trade names by most of the leading manufacturers. Thus "Rapard" is produced by the Dunstable Portland Cement Co., "Rapidcrete" by the British Standard Cement Co., "Tunnelite" by the Tunnel Portland Cement Co., and "Vitocrete" by the Ship Canal Portland Cement Manufacturers and associated concerns. In addition, there are "Barnstone" and other rapid-hardening cements too numerous to mention individually.

Rapid-hardening cements have made excellent progress in the domestic market, sales during 1927 having been fully double those for the previous year. This gratifying feature is not surprising and fully justifies the optimism expressed on the first appearance of this type of portland cement. The fact that its strength at four days is greater than that of ordinary cement after the lapse of 28 days was bound to produce far-reaching effects on everyday practice, inasmuch as it places cement concrete in practically the same category as that of factory-prepared building materials so far as rapidity of construction is concerned. The new type has, indeed, revolutionized ideas on road construction and repair, for it is no longer necessary to close a thoroughfare for two or three weeks while the concrete foundation is hardening and subsequently for a further period while the paving work is in progress.

Other Special Cements

Still further saving of time can be effected by the use of aluminous cements, originally produced only in France but now made by the Lafarge Aluminous Cement Co. under the name of "Ciment Fondu," and by two or three other British firms. Aluminous cement is materially higher in cost than rapid-hardening portland cement, but it possesses counterbalancing advantages, especially in the execution of works where speed of construction is an essential factor, in the conduct of work in cold, frosty weather, and in the production of precast structural units for buildings, bridges, foundations and piles.

Another cement possessing distinctive qualities which is produced in Britain is "Super cement." It is manufactured by several leading firms. In Scotland extensive use is now being made of "Giscol," consisting of portland cement clinker containing a proportion of granulated blast furnace slag added in the final grinding. This cement is produced under rather unusual conditions, being the only cement manufactured with the incorporation of blast furnace slag in which all the raw materials are produced by the same firm and controlled by them from their various sources of supply. The firm in question is the Glasgow Iron & Steel Co., of Wishaw.

Increased Production Capacity

Many existing works were considerably enlarged and a number of new works were constructed and equipped by recently formed companies as well as by old-established concerns during 1927—evidence of the confidence of manufacturers in the continued increase of the demand for cement. Important among reconstructions and enlargements may be mentioned the Bevan works of the Associated Portland Cement Manufacturers at Northfleet. The work of equipping this establishment has been going on for some time past and is now completed—so far as that is possible in the present progressive era. With an outlet capacity of over 500,000 tons annually, the Bevans works are the largest and best equipped of the kind to be found in Europe. The remodeling and extension of existing plant was also taken in hand at the Swanscombe works of the same organization, and at the Woodham works, Essex, of the British Portland Cement Manufacturers, Ltd. The Hull firm of G. & T. Earle, which anticipates that 1928 will prove a record year from every standpoint, has for several months past been engaged in building and equipping an entirely new factory at Hope in Derbyshire, at a cost of approximately £400,000 ($2,000,000), with the object of providing for the economical and prompt supply of its cements in the Manchester, Sheffield, Chesterfield, Barnsley, and the Potteries districts.

The works will be screened by hills, so that there will be no disfigurement of the scenery of the beautiful Hope Valley except in their immediate neighborhood. As the undertaking will involve the payment of some £30,000 ($150,000) per year in wages, it has been received with enthusiasm in the district. Another popular feature is that supplies of electricity from the works will be available for local residents.

In the Middlesbrough district Messrs. Casebourne & Co. last year completed the building of an additional cement works, with a new super kiln 283 feet in length, thereby increasing their production capacity to an extent which it is hoped will enable them to meet the continued increase in the demand for cement in the northern areas.

The scholastic county of Oxford, heretofore not regarded as a seat of the British cement industry, now has two small undertakings being remodeled on a large scale. One of these, owned by the Chinnor Cement and Lime Co., was producing only 15,000 tons of cement per annum last year, but an entirely new plant with an output capacity of 85,000 tons per annum is now being installed and will probably be completed next May. The other concern is the Oxford & Shipton Cement Co., of Kirtlington, a new company which last year purchased the business of the Oxford Portland Cement Co. It is now engaged in the construction of additional works, having an output capacity of 125,000 tons annually, on the Oxford Canal, close to a freight depot of the Great Western Railway. Including the output of the original works the production capacity of the company will shortly be about 150,000 tons per annum. The cement produced can be distributed directly from the works by canal, road or rail, and the firm has established cement stores with similar facilities at Oxford, Birmingham and Coventry.

Consolidations

An outstanding feature of 1927 was the further development of concerted plans for the sale and distribution of cement to consumers in all parts of the United Kingdom. The activities of the two great British combines—the Associated and the British Portland Cement Manufacturers—are widely known, their district representatives, offices and stores constituting a widespread network of efficient commercial organization. In 1927 another combination came into being—the Ship Canal Portland Cement Manufacturers in the northwest; Greaves, Bull & Lukin, of Herbury, in the Midlands; and the Holborough Cement Co., of Snodland (Kent) in the southeast. For the sale and disposal of the cements produced by these undertakings a mercantile and administrative organization was formed under the name of the Portland Cement Selling & Distributing Co., with offices in London, where the entire distribution service is centralized, orders being allocated to the particular works which happen to be in the most favorable position to deliver the cement with minimum delay to any given district in the country. A similar but rather smaller organization was also established last year by the Dunstable Portland Cement Co., and Smead, Dean & Co., of Sittingbourne, working in connection with Young & Son, of London, who attend the sale and distribution of the cements produced by the two factories.

Many public works schemes were started and completed during 1927, one of the most outstanding being the completion of the Gladstone Docks at Liverpool. These concrete docks were constructed of reinforced concrete at a cost of approximately £8,000,000 ($40,000,000) and were officially opened by King George. Including the river entrance lock, the scheme adds over 54 acres of water area to the port, and some three miles of quayage. On both sides of the River Mersey good progress was made with the new tunnel. The Manchester reservoir, which has cost $5,000,000 was practically completed. The capacity of this reservoir is 560,000,000, and it covers 77½ acres.

Cement Day to Open Spring Mineral Industries Meet

Cement Day will open the conference of mineral industries of the Lehigh Valley, to be held at Easton, Pennsylvania, on April 25th, 26th, and 27th. The Alpha Portland Cement Company plant will be visited in the afternoon, followed by a dinner given by the company. The evening program will be devoted entirely to the cement industry.

It is probable that the ceremony of breaking ground for the new John Markle Mining building at Lafayette college will be a part of the conference program. The conference dinner will be held on Thursday, April 26th.

The Hotel Easton is the conference headquarters. Professor W. B. Plank is the chairman.

The purpose of the conference is to bring together in the Lehigh Valley from nearby metropolitan districts persons familiar with the problems of the manufacture of cement, steel and slate, and through inspection trips and technical and semi-technical discussions, solve the common problems.

Cement Statistics for January

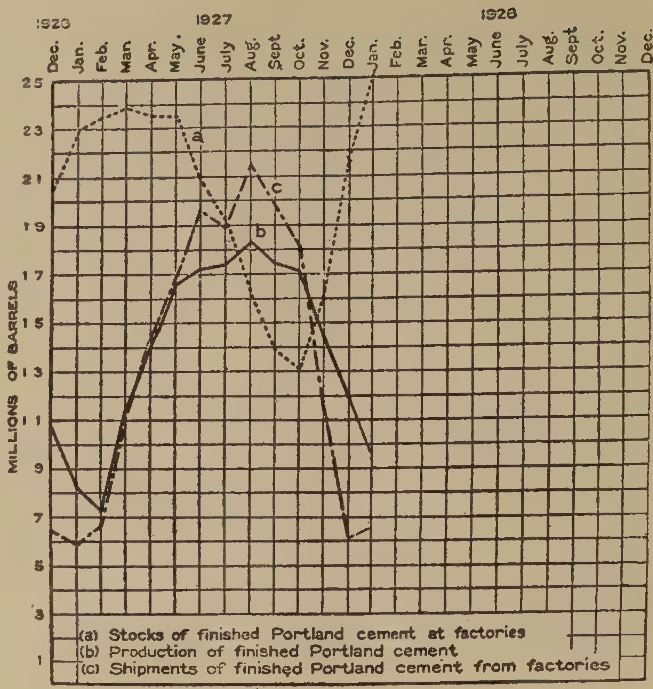
THE portland cement industry in January, 1928, produced 9,782,000 barrels, shipped 6,531,000 barrels from the mills, and had in stock at the end of the month 25,193,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in January, 1928, showed an increase of nearly 12 per cent, and shipments an increase of about 11 per cent, as compared with January, 1927. Portland cement stocks at the mills were 11 per cent higher than a year ago.

The statistics here presented are compiled from reports for January from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 155 plants at the close of January, 1928, and of 141 plants at the close of January, 1927.

Relation of Production to Capacity

	January 1928	January 1927	Dec. 1927	Nov. 1927	Oct. 1927
	Per cent	Per cent	Per cent	Per cent	Per cent
The month	49.5	45.1	60.7	75.9	87.4
The 12 months ended	74.5	76.4	76.2	73.7	73.6



Production, Shipments and Stocks of Finished Portland Cement, by Months and by Districts, 1927 and 1928, and Stocks in December, 1927

	Production 1927	Production 1928	Shipments 1927	Shipments 1928	Stocks at end of month 1927	Stocks at end of month 1928
January	8,258,000	9,782,000	5,968,000	6,531,000	22,914,000	25,193,000
February	7,377,000		6,731,000		*23,563,000	
March	*11,450,000		*11,100,000		23,922,000	
April	14,048,000		14,350,000		23,654,000	
May	16,701,000		16,865,000		23,503,000	
June	17,224,000		19,761,000		20,972,000	
July	17,408,000		18,984,000		19,397,000	
August	18,315,000		21,411,000		16,292,000	
September	17,505,000		19,828,000		13,996,000	
October	17,174,000		18,105,000		13,141,000	
November	14,449,000		11,619,000		*16,022,000	
December	11,999,000		6,200,000		21,821,000	
	171,908,000		170,922,000			

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*Revised.

District—	Production—January 1927	Production—January 1928	Shipments—January 1927	Shipments—January 1928	Stocks at end of January 1927	Stocks at end of January 1928	Stocks at end of Dec., 1927*
Eastern Pennsylvania, New Jersey, Md.	2,510,000	2,351,000	1,422,000	1,545,000	5,116,000	5,886,000	5,080,000
New York	318,000	549,000	165,000	316,000	1,438,000	1,761,000	1,529,000
Ohio, Western Penn., and West Virginia	563,000	755,000	420,000	458,000	2,620,000	2,926,000	2,630,000
Michigan	448,000	374,000	261,000	295,000	2,093,000	2,220,000	2,141,000
Wisconsin, Illinois, Indiana, and Kentucky	923,000	1,408,000	464,000	501,000	3,441,000	3,480,000	2,573,000
Virginia, Tenn., Ala., Ga., Fla., and La.	899,000	1,109,000	921,000	938,000	1,167,000	1,851,000	1,680,000
Eastern Missouri, Iowa, Minn., and So. Dak.	509,000	1,096,000	247,000	284,000	3,199,000	3,544,000	2,731,000
Western Missouri, Nebraska, Kansas, Okla.	468,000	451,000	398,000	451,000	1,847,000	1,622,000	1,623,000
Texas	383,000	463,000	365,000	447,000	461,000	423,000	407,000
Colorado, Montana, and Utah	121,000	175,000	77,000	67,000	518,000	473,000	364,000
California	974,000	939,000	1,088,000	1,111,000	551,000	616,000	788,000
Oregon and Washington	142,000	112,000	140,000	118,000	463,000	391,000	396,000
	8,258,000	9,782,000	5,968,000	6,531,000	22,914,000	25,193,000	21,942,000

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*Revised.

EDITORIALS

What Price Change?

ONE of the chief subjects of conversation these days on construction jobs and in products plants hinges on the question, "What is happening in the cement industry?"

Much is being said about special cements—about portland cements having special or added qualities over and above those commonly conceded to standard portland cement. This cement is sold for that particular purpose. Another for another purpose, etc.

The result is that the buyer is confused. There is very little standardization of claims and sales arguments. In one section of the country this and that type of portland cement is aggressively merchandised. In another section two other types are presented to the buyer with equal force. Yet the sales claims in the two locations may—and often are—entirely distinct.

In the keen sales competition and the rush to get business there is a distinct danger to the cement industry. The wide range of sales appeals and the fact that these vary in different parts of the United States introduce the danger of a departure from the advantages that follow standardization.

That changes in cement marketing are here now cannot be denied. But can these changes not be accompanied by a parallel and simultaneous effort to stabilize types of cement—to make, say two or three types, available throughout the country and to have some definite means of identifying these types through standard specifications?

We cannot blindly follow in the footsteps of European practice and say that because this or that type of cement is sold there, it must of necessity be made available in the United States. American concretors have an entirely different attitude toward cement than European concretors. While European experience may point the way to the solution of the American cement problem, it must not be forgotten that our problem must be considered in the light of our past experience and that the advantages that have previously come because of standardization should not lightly be cast aside.

The need in the cement industry now is for cooperation and agreement as it was in the past when cement manufacturers first struggled for recognition of American made portland cements. That more than one "standard" type of cement is demanded by the concretor, is evident. Is it not the part of wisdom to accept this fact and then to bend all efforts toward determining the best means of supplying these two or three types of cement under conditions that will make them easily recognizable and that will make the same types available throughout the entire United States?

Power Plant Efficiency

ONE of the notable accomplishments in the operation of portland cement plants is the reduction of from 40 to 50 per cent in the use of fuel required. A large part of these savings are, of course, due to better burning methods, but a part of them, at least, are due to power plant cost reduction, either through the installation of waste heat equipment or to greater power department efficiency.

There are still opportunities to secure even greater economies in power supply and in power utilization. In some plants the generation of excess power can even be looked upon as a legitimate by-product of cement manufacture. Many mills are located in or adjacent to small communities whose power requirements are not large. Under favorable conditions these requirements could be met by the excess power supply from the mills — provided, of course, that the power plant is operating at an efficiency to make this possible.

The present trend toward operating economies makes it more necessary now than ever before to reduce costs wherever possible. The inefficient plant is apt to find the going more difficult than before. With this condition has come a closer attention to manufacturing efficiency and certainly not the least of the things that the average manufacturer can do to help reduce his cost is to see to it that every pound of coal he uses delivers the greatest possible returns in clinker and in power.

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MEN and MILLS

Notes from the Field

Erection of Georgia Portland Plant to Begin in Summer

Another Added to List of Mills Producing Quick-Hardening Cement—Annual Capacity to be 600,000 Barrels

Construction of a $2,000,000 plant for the Georgia Portland Cement Corporation at Sandersville, Ga., is expected to begin early in the summer, according to the H. K. Ferguson Co., Cleveland engineers who are designing and will build the plant.

It is proposed to produce quick-hardening cement at the rate of 600,000 barrels a year.

The plant location adjoins a bed of limestone containing about 13,000,000 tons. Good clay is plentiful and the site is within reach of two railroads.

W. H. Kewish, special engineer of the H. K. Ferguson Co., for cement plant design, is directing plans for the equipment. R. F. Bell is in charge of the building design.

The stockholders' annual meeting was held at the company offices in Augusta on January 30th. The board of directors and officers of the preceding year were re-elected.

Alpha Stockholders Hold Annual Meeting in New Jersey

The annual meeting of Alpha Portland Cement Company stockholders was held on January 25th at Jersey City, New Jersey. The following directors were re-elected for the ensuing year: G. S. Brown, Easton; C. K. Boettcher, Denver, Colo.; F. M. Coogan, Phillipsburg; C. A. Irvin, Chicago; J. H. Lockhart and J. M. Lockhart, Pittsburgh; F. G. McKelvy, Easton; C. H. McNider, Mason City, Iowa, and L. H. Porter, New York City.

The board was organized by the election of the following officers: president, G. S. Brown; vice-presidents, F. M. Coogan, C. A. Irvin and F. G. McKelvy; secretary, Robert S. Gerstell, Easton; treasurer, J. J. Matthes, Phillipsburg; assistant secretary and assistant treasurer, F. G. Lyons, Easton, and W. E. Viets, Chicago.

Reports stated that the 1927 volume of business had been satisfactory, but that earnings, due to overcapacity and foreign competition, were less than those of the preceding year.

Monolith Plans to Make Mill Largest in West

The Monolith Portland Cement Company is making plans to enlarge its Tehachapi Valley (Calif.) plant to make it the largest cement plant in the West, according to reports. Application has been made to the county board of supervisors for relocation of a portion of county highway to make room for additional railroad facilities. Immediate enlargement, costing $350,000, is contemplated.

Lawrence Official Retires

Ernest R. Ackerman of Plainfield, New Jersey, has retired from the Lawrence Portland Cement Company, with which he was associated for many years as an official. His interests have been acquired by his brother, Marion S. Ackerman, vice-president, and Frank H. Smith.

Mr. Ackerman's duties as a New Jersey representative to Congress are given as the reason for his retirement. He was formerly also state banking commissioner of New Jersey and is at present director of several banking institutions.

Profit Increase Shown by Wolverine Report

A net profit of $82,444 for 1927 was made by the Wolverine Portland Cement Company, according to reports published. This equals 82 cents a share earned on its 100,000 shares of $10 par value capital stock in 1927, against 12 cents a share in 1926 and 62 cents a share in 1925.

New York and New England Plant Shuts Down

The Greenport, New York, plant of the New York and New England Cement & Lime Company, shut down on January 16th. As many employees as possible will be engaged in repair work.

Trinity Buys Land

Announcement has been made of the purchase of a tract of 164.93 acres with frontage on the San Jacinto river by the Trinity Portland Cement Company. Consideration paid for the land was not announced.

Nazareth Seeks Increase in Capital Stock

A special meeting of the stockholders of the Nazareth Portland Cement Company has been called for April 9th at Easton, Pa. The purpose of the meeting is to approve or disapprove an increase in the capital stock. The proposed increase would be from 157,500 shares without nominal or par value to 210,000 shares of which 200,000 would be common stock without nominal or par value and 10,000 shares of 7% cumulative convertible preferred stock of the par value of $100 each.

At the annual meeting of stockholders held early in February at Easton, the following directors were elected: John M. Hincks, Alfred L. Ferguson, M. J. Warner, H. M. Whiting, John H. Goss, Dr. W. Whitehead, Alfred W. Dater, David S. Davis, Joseph Brobston, and George F. Coffin.

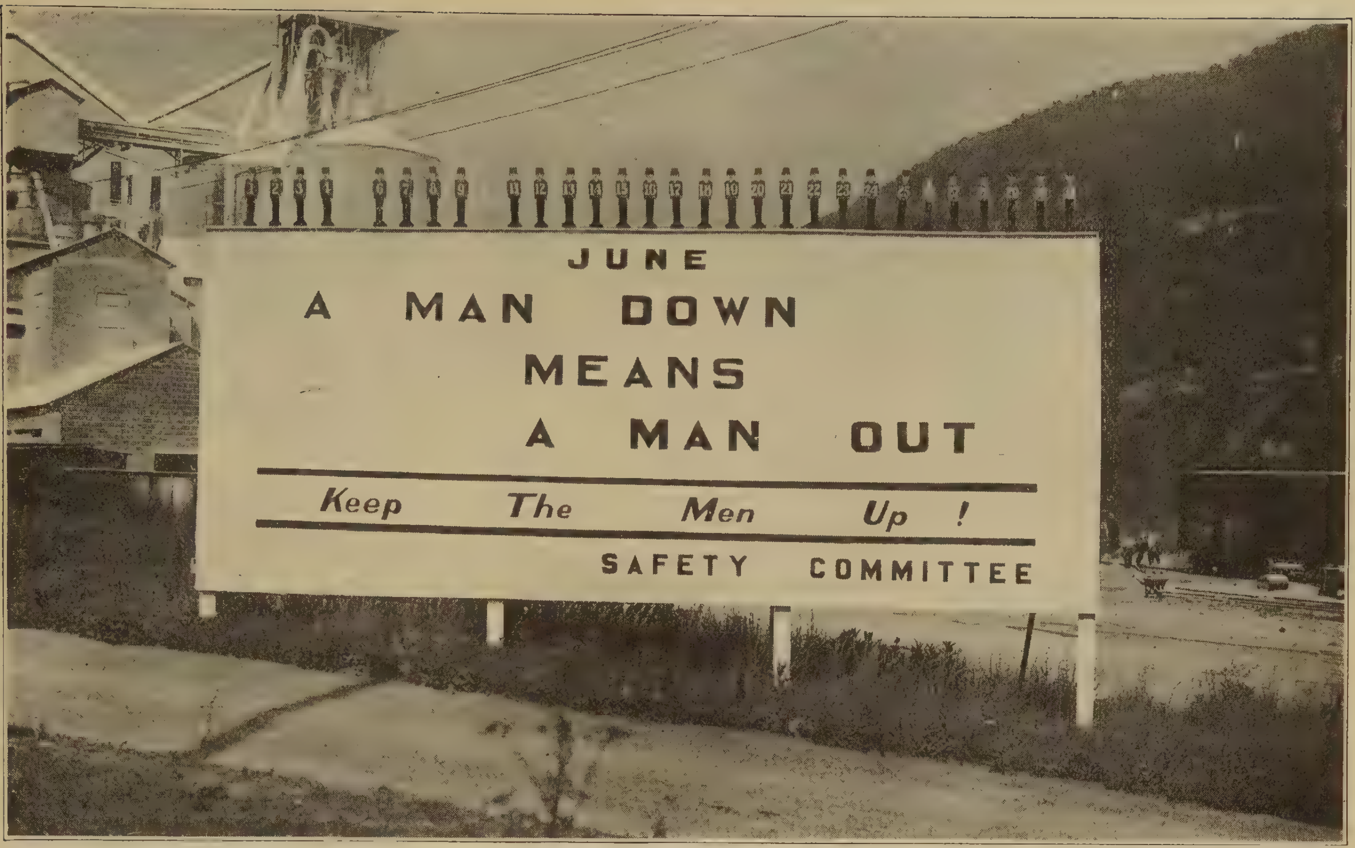
U. S. Portland Appeals Case Involving Appraisal of Plant

That the United States Portland Cement Company is not satisfied with the sale valuation of $1,550,000 set on its plant at Concrete, Colorado, by appraisal engineers, is seen in the appeal that has been made. According to United States District Attorney George Stephen, the case will be heard early in March. The appraisers are said to have found the physical value to be $2,785,132.

This plant was ordered sold by the federal court when the Cement Securities Company was dissolved four years ago. The sale has been delayed by lack of agreement on the value of the plant. The owners have signified their willingness to obey the mandate of the court provided a value fairly close to their estimation of the physical worth of the plant is arrived at.

International Shows Increase in 1927 Profits

The International Cement Corporation consolidated profit and loss statement for the four quarters of 1927 shows a net surplus of $4,554,714.20. The net surplus of the fourth quarter, $1,271,194.88, was the highest for the year. The year's increase is approximately $200,000 over 1926.



A (wooden) man may be down but he's never out, permanently. When circumstances are against him and he is knocked down, he starts all over again at the beginning of the next month. At the top of a huge signboard maintained by the American Lime & Stone Company at the Bellefonte, Pa., plant is a row of wooden dummies. Each dummy represents a certain day of the month. For each injury which causes loss of time one of the men is knocked over. The wording of the sign exhorts the workers to strive toward keeping all the men standing up

Glens Falls Files Counter-Brief for Lower Rates

Five reasons why it should be given a lower freight rate in order to compete with cement manufacturers in the Lehigh district of Pennsylvania are presented in a brief filed on January 26th by the Glens Falls Portland Cement Company, Glens Falls, N. Y., with the Interstate Commerce Commission at Washington, D. C.

This brief follows closely upon another filed on January 24th by eight New Jersey and Pennsylvania cement manufacturers upholding an Interstate Commerce Commission examiner's decision that the present rate differential should continue. The latter brief holds that if Glens Falls is given its claim for a lower freight rate on its products to New England markets, a monopoly will be created in the Allentown-Northampton district of Pennsylvania. In the three sets of rate cases now before the commission, the railroads maintain that each group is seeking reduced tariffs solely to get the business now enjoyed by the other.

The Atlas Portland Cement Company, Hudson, N. Y., is in one group. Glens Falls Portland asserts that existing rates now favor both the Atlas Portland Cement and the Pennsylvania group.

That the present differential should continue is asked by the following: Coplay Cement Manufacturing Company, Edison Portland, Giant, Hercules, Nazareth, and the Vulcanite Portland companies.

In another brief the Alpha Portland Cement Company says it is taking no part in the proceedings but that it will protect its interests and that it would be affected by any change in the rate from Glens Falls.

Reasons presented by the Glenns Falls company why the rate should be lowered, the New England market being particularly in mind, are that under any reasonable basis of rates that may be prescribed, the Hudson (N. Y.) mills should be embraced within a single group, as are the mills of the Lehigh district; rates on cement, now maintained from Glens Falls to southern New England destinations, are unreasonably high, and that a reasonable scale of rates should be prescribed, to be uniformly applied from all mills.

Transport Company Organized to Haul Cement

The Cement Transport Company is reported to have been incorporated on February 7th at Toledo, Ohio, with a capitalization of $5,000 and headed by J. W. Riddle, district sales manager of the Sandusky Cement Company.

It is planned to put into service shortly a fleet of heavy tonnage trucks for hauling cement.

Petoskey Re-elects Officers and Directors

The board of directors and officers of the Petoskey Portland Cement Company were re-elected at the meeting of the stockholders held on January 25th at its offices in Petoskey, Michigan.

St. Louis Quarrymen Hold Annual Meeting

At the annual meeting of the St. Louis Quarrymen's Association, February 15th, the following officers were elected: president, Wm. Eyermann; vice-president, Theodore Fehlig, and secretary-treasurer, J. W. McCullough. Col. E. J. McMahon continues as executive secretary.

The retiring president, Louis Skrainka, was given a vote of thanks for his excellent work during 1927. Under his direction two advertising campaigns were carried on, one dealing with limestone as an aggregate, and the other, a joint campaign with the Associated Stone Mason Contractors, covering the use of rubble and building stone. Both resulted in considerable tonnage gains.

The association was also successful in securing a reduction of about 25 per cent in the state liability insurance rate.

Rumors Denied at Ideal Cement Company Stockholders' Meeting

Officers and Board of Directors Re-elected at Denver Meeting

Stockholders of the Ideal Cement Company held their annual meeting at the offices of the company at Denver, Colorado, on January 25th, for the purpose of reviewing 1927 operation, electing a board of directors and officers for the coming year, and attending to routine business.

Outside of the customary procedure, the only important action was the setting at rest of several rumors current in local financial circles for some time. One of these, denied at the meeting, was that the directors planned to issue another call for preferred stock soon, mentioning an amount approximating the $2,000,000 that were retired in 1927. Another rumor was that an earnings statement for the year past would be disclosed at the meeting. No financial report has been issued for many years and a precedent was not established at this meeting.

A rumor that is still given credence is that regarding an increase in the present $5 annual dividend on common stock, to be announced some time during 1928. The present rate is $1 a share quarterly, with $1 extra at Christmas. An increase to $1.50 quarterly is talked of.

All former directors were re-elected to office at the stockholders' meeting and former officers were re-elected at the directors' meeting, as follows:

Directors, Charles Boettcher, C. K. Boettcher, Harry C. James, R. J. Morse, J. Q. Newton and James B. Grant of Denver, and Robert S. Gast of Pueblo. Officers, Charles Boettcher, president; C. K. Boettcher, vice-president; Harry C. James, vice-president and treasurer, and R. J. Morse, vice-president, secretary and general manager.

Bankers Make Offer for Keystone Plant; Not Accepted

Keystone Portland Cement Company stockholders held their first annual session at the new plant near Bath, Pennsylvania, on January 26th. The plant, now under construction, was inspected and its progress noted.

A proposition made to the stockholders by banking interests for the purchase of all the company's holdings was presented but did not receive favorable consideration.

The following directors were elected: Fred B. Franks, Sr., Harvey H. Farr and John Buckland, Allentown; Rufus W. G. Wint, of Wint's Lumber Company, Catasauqua; Herbert Dillard, Bangor; Charles Groman, Bethlehem; Hon. Edward J. Fox, former supreme court justice of Pennsylvania, and David Skillman, both of Easton.

These officers were elected by the directors: John Buckland, president; Fred B. Franks, vice-president and general manager; E. J. Fox, treasurer; R. P. Johnson, Allentown, secretary.

Chief Chemist of Volunteer Dies

Lute E. Foster, who a few weeks ago joined the Volunteer Portland Cement Company as chief chemist, died at Edgehill, Tennessee, on Monday, February 13th. His home was at Tekousha, Michigan.

Lehigh Stockholders' Annual Meeting Held

The annual meeting of stockholders of the Lehigh Portland Cement Company was held at Allentown, Pennsylvania, on January 18th. In the reports made it was stated that Lehigh is the largest cement manufacturing organization in the world, with a yearly output of 23,400,000 barrels.

Following the meeting held in the Young Building, the stockholders were entertained at a local club and the office forces at another.

Lehigh Foremen Gather for Annual Banquet

Twenty department foremen of the Lehigh Maryland plant at Union Bridge, who comprise the plant safety committee, journeyed to the neighboring town of Frederick for their annual meeting and banquet on January 20th. They were accompanied by Major H. A. Renninger, head of the Lehigh safety department.

W. C. Thompson acted as toastmaster. Talks, along accident prevention lines, were interspersed with music and entertainment. Those who attended were G. S. LaForge, W. C. Thompson, H. B. Fogle, J. E. Coover, C. E. Selby, W. Reaver, G. R. Lowe, C. S. Rogers, P. M. Rinehart, C. E. Eichelberger, W. G. Skinner, C. S. Moyer, P. Weller, H. L. Broadwater, R. Green, T. Myers, H. Gray, M. L. Saylor, W. L. Selby, M. B. Wilson and Dr. Jas. T. Marsh.

O. J. Stonesifer, Dr. A. A. Radcliff and Harry E. Chapline were guests.

Electrical Equipment Ordered for Seattle Plant

Negotiations have been closed for machinery and electrical equipment costing in excess of $350,000 for the Seattle cement plant to be constructed by the newly organized Pacific Coast Cement Company. The first shipment of machinery, most of which will come by way of the Panama Canal, will be made April 25th. About 35 days will be required for delivery.

The contract for the cement plant machinery proper has been placed with the Traylor Engineering & Manufacturing Co. of Allentown, Pa. The General Electric Co. received the order for the motors.

The Traylor Engineering & Manufacturing Co. award involves an outlay of $315,000 and the General Electric contract approximately $40,000. The Traylor order includes two 11 foot 3 inch by 40 foot, 4 single roll support rotary kilns; two 54 foot diameter bucket type kiln feeders; two 9 by 90 foot coolers; two 7 by 45 foot 3-compartment grinding mills; one 42 by 48 foot cast steel crusher; one 26 foot diameter wash mill; and one 4 by 12 foot cast steel apron feeder.

The order placed with the General Electric Company includes three 750 h. p. motors for mill drive and about 20 miscellaneous motors from 7½ to 200 h. p.

The plant will have a yearly capacity of 1,200,000 barrels. It is located on a 19 acre site fronting 560 feet on an ocean-entrance waterway at the port of Seattle, and will bring its limerock material by water from Dall Island, located about 600 miles from Seattle.

Macasphalt Corporation Formed; to Manufacture Cement and Chemicals

A charter has been filed at Dover, Delaware, for the incorporation of the Macasphalt Corporation of America, to manufacture cement and chemicals. Capital is $700,000, with 100,000 shares of no par value. Alfred E. Becker, Joseph Orloff, and Abraham Chernow of New York City are the incorporators.

City Asks Lower Rate of Oklahoma

A change in freight rates was asked by E. M. Fry, city manager of Oklahoma City, Oklahoma, at a conference with Chauncey Nichols of the Oklahoma Portland Cement Company recently. The city objects to paying the freight rate from Iola, Kansas, although its cement comes from Ada. The city thus is forced to pay 16 cents a barrel more than does the city of Tulsa, although the former is closer to the shipping point.

Maine's Cement Plant Complete in Spring

Lawrence Portland Cement Company Plant at Thomaston Ready About May 1st—Latest Developments in All Departments Used in This Plant

Plans in keeping with its importance are being made to celebrate the opening of New England's first cement plant—that of the Lawrence Portland Cement Company between Thomaston and Rockland, Maine. Work is being pushed to make completion possible some time in May.

The local press has given much space to the construction of the plant and these facts are gleaned from that source.

The main supply of rock will be furnished by a formerly abandoned limestone quarry, 600 feet long. The clay is excavated by a scrapper bucket and dropped into 6-yard dump cars by a gasoline locomotive. The crane travels on a track 55 feet above the ground and dumps the clay into a building in which 3 months' supply may be stored. The crane takes the clay from storage and deposits it in the hopper of a granulator. The discharge from the granulator passes between a pair of rolls.

After leaving the rolls the clay drops into a mixing basin 26 feet in diameter and eight feet deep.

The kiln building contains two kilns each 200 feet long and 11 feet in diameter, equipped with coolers 90 feet long. Slurry tanks, of which there are 12, are 12 feet in diameter, 20 feet deep and set in caissons 10 feet underground and on rock bed.

The coal mill, 50 by 70 feet, is equipped with pulverizers.

The coal mill dryer has a capacity of 13 tons. The coal pit is located at the entrance to the mill, beneath a railroad trestle. The coal is dumped from the cars into the pit and is then carried by a conveyor to a single roll crusher and then to bins from which it is conveyed to the dryer, to the pulverizer and to the feeders.

The raw storage bins for gypsum, crushed stone and clinker are 113 feet wide, 400 feet long and 71 feet high. They have a capacity of 80,000 tons, 25,000 tons of stone, and 35,000 tons of clinker. The gypsum is received from Nova Scotia.

The mill building, 58 by 132 feet, and the motor building, 35 by 200 feet adjoining, are built on caissons set at bed rock. There are 4 compeb mills, two wet and two dry, each 40 feet long and with 800 h. p.

The crusher building near the quarry has two structural steel inclines extending from the building into the quarry. The cars or trucks when loaded weigh about 20 tons each and are pulled up a 30-degree incline to the crusher where the cars are dumped into the crusher hopper. Precautions have been taken to provide for every possible emergency. The hoist cannot be started in the wrong direction, cannot wind beyond a certain speed, must slow down at a predetermined rate on approaching the limit of hoisting and cannot pull the car beyond the proper dumping position. The crusher, which extends 66 feet above ground, has a capacity of 250 tons per hour, as has also the secondary crusher.

The change house accommodates 200 men and is modern in every respect. Baskets instead of lockers will be used. Work clothes will hang in the baskets, which are raised almost to the ceiling by a chain. There a strong draft of air will be blown through them by electric fans. Hooks are attached to the baskets with hangers for street clothes.

The machine shop, a large 2-story building, will house a supply shop and first aid hospital in charge of a nurse.

The nearby store house contains the heating plant for the machine shop, change house and truck garage. Oil burners will be used in the heating plant, a 30,000 gallon tank furnishing the fuel. A second tank with a capacity of 10,000 gallons will furnish fuel for the office building boilers.

Volunteer Equipment Almost Completely Installed

Practically all machinery has been delivered and is now being installed in the new Volunteer Portland Cement Company plant at Knoxville, Tennessee.

Many men to be on the operating force are engaged in the construction work. Completion is expected some time in the spring; no definite date has been set.

Lawrence Elects Directors and Officials

At the annual meeting of stockholders of the Lawrence Portland Cement Company, at Northampton, Pa., Frank H. Smith was elected as president; Marion S. Ackerman, first vice president; Charles A. Porter, second vice president; J. S. VanMiddlesworth, secretary; Edgar F. Shephard, treasurer; Miss C. M. Loser, assistant treasurer.

Asano Company Assumes Control of Japan Cement Company

The Japan Cement Company has been placed under the control of the Asano Portland Cement Company. The readjustment plan and an agreement concluded between the two companies regarding the sales of products and financial assistance have been approved by the former institution. In consequence, four directors of the Asano interests have joined the directorate of the Japan Cement and thus the Asano Cement practically has placed the Japan Cement under its exclusive management.

It has been agreed between the two companies that the Asano Cement undertake sales of the Japan Cement products and render financial help to the maximum amount of 500,000 yen, subject to increase according to circumstances. The Japan Cement offers to the Asano Cement as security for loan a mortgage syndicate consisting of its Saegi and Yatsushiro factories.

Mr. Soichiro Asano, president of the Asano Portland Cement Company, has a franchise to reclaim about 20,000 acres of land in Toyama prefecture to erect cement factories there. The company has appropriated 1,350,000 yen for the construction cost.

Lehigh Valley Engineers' Club Schedules Interesting Meetings

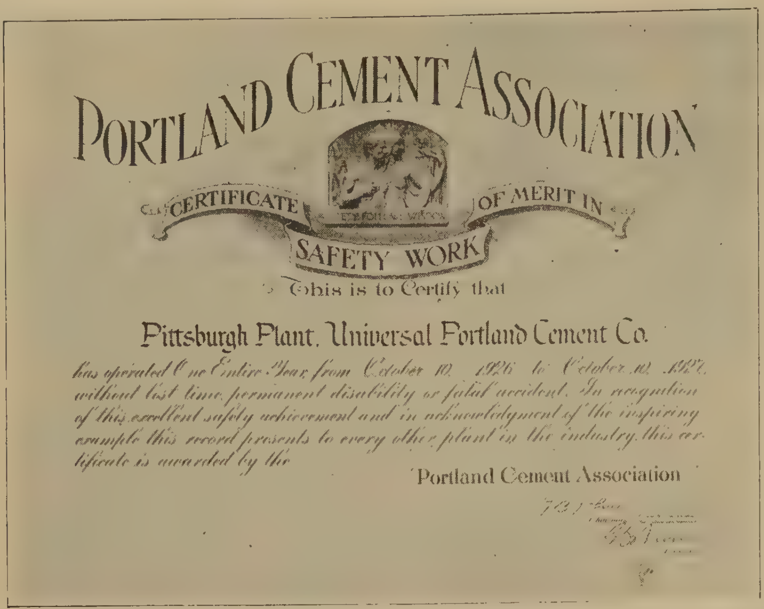
On Friday, January 27th, the Engineers' Club held its first meeting of the year at Drown Hall, Lehigh University. An interesting program is being arranged for other meetings. As the club numbers among its members a great many men engaged in the cement industry, the various phases of cement manufacture will come in for a share of the yearly program.

Middle West Freight Rates to Be Investigated

Investigation of freight rates on shipments of cement of from one to eighty miles in the territory including Indiana, Ohio, Illinois, and Michigan has been ordered by the Interstate Commerce Commission. Present rates for the distances now range from 6⅛ to 9 cents per hundred pounds. It was not stated whether an increase or reduction is sought.

Penn-Allen Digs Tunnel Under Rock Storage

The Penn-Allen Cement Company at Nazareth, Pennsylvania, has begun construction of a tunnel under its rock storage, to be 230 feet long and of reinforced concrete, a concrete retaining wall 30 feet long and a relief or escape tunnel 60 feet long, also under the rock storage.



PORTLAND CEMENT ASSOCIATION

CERTIFICATE OF MERIT IN SAFETY WORK

This is to Certify that

Pittsburgh Plant, Universal Portland Cement Co.

has operated One Entire Year from October 10, 1926 to October 10, 1927, without lost time, permanent disability or fatal accident. In recognition of this excellent safety achievement and in acknowledgment of the inspiring example this record presents to every other plant in the industry, this certificate is awarded by the

Portland Cement Association

As soon as a cement plant has run 365 days without having a lost time or fatal accident, it is eligible for a Portland Cement Association certificate similar to that shown above. It reads ". . . has operated one entire year from October 10, 1926, *to October* 10, 1927, *without lost time, permanent disability or fatal accident. In recognition of this excellent safety achievement and in acknowledgment of the inspiring example this record presents to every other plant in the industry, this certificate is awarded by the Portland Cement Association." The "year" may begin at any time*

Giant Cement Workers Given Community House

About 1,000 workers and their families were present at the opening, on January 27th, of a community welfare building erected by the Giant Portland Cement Company at Egypt, Pennsylvania. The gift is largely the result of the efforts of O. D. Havard, general superintendent of the Egypt plant. During the fifteen years in which he has been connected with the plant, Mr. Havard has been one of the leaders in the adoption of safety measures and has taken an active interest in both the men and their homes.

As a representative of the company, Mr. Havard turned the building over to the employees, informing them that it was not only for their use but their families as well. The gift, he said, was presented by the company for their genuine interest in the concern.

Herbert Reppert, representing the employees of the plant, accepted the building and spoke a word of thanks. The addresses were interpreted to his fellow countrymen by Samuel Neipower.

Preceding the presentation of a minstrel program, W. W. Ditter, chief inspector and safety engineer for the State Workmen Insurance Fund, and George H. Henninger, of Allentown and district manager of the same organization, addressed the gathering.

The building is a well appointed two-story concrete building situated on the company grounds, and is 44 by 118 feet. The building and its equipment will be governed by the employees, assisted by the plant nurse and Mr. Havard.

Davis Substitutes for Vice President Chas. Porter

During the illness of vice-president Chas. A. Porter, of the Lawrence Portland Cement Company, it became necessary for another man to step into his place and continue the supervision of the plant construction at Rockland, Maine. E. J. Davis, general manager, was chosen. Mr. Davis will have charge of the plant when it reaches the production stage.

He has been in the cement business for forty-two years and has taken part in the construction of several plants. The first of consequence was that of the Maringo Portland Cement Company at Youngstown, Ohio. He later joined the staff of the Fuller Engineering Company of Allentown. He is also responsible for the building of the Dominion Portland Cement Company plant in northern New Zealand, as well as two others for the Fuller Engineering Company in Australia and South Africa.

Operation Resumed by Lehigh Plant at New Castle

After a shutdown of several months due to excessive stock, the 300 employees of plant No. 3 of the Lehigh Portland Cement Company at New Castle, Pennsylvania, returned to work late in January.

Cement Imports for 1927 Below 1926

In spite of the fact that the use of cement increased some 5½ per cent last year in the United States, the importation of cement declined approximately 900,000 barrels below the figure for 1926. This is in part offset by the fact that imports in December and November, 1927, ran a little ahead of the same months of 1926. Prices at which this foreign cement was sold were exceedingly low, however, and probably must remain very low to maintain this increase in imports.

The general decline for the year of nearly 900,000 barrels is a very hopeful symptom, however, and would seem to indicate that American builders are beginning to realize the mistake of purchasing an unfamiliar foreign product in order to save a few cents.

A careful watch is being kept on the situation by some of the more important American producers selling on the eastern seaboard, and it seems probable that their efforts to educate cement users as to the economic effects of buying foreign cements may result in a still lower volume of imports for 1928.

Penn-Dixie Plant to Erect Tramway Bin

Work is to start shortly on the construction of a reinforced concrete bin at the tramway loading terminal of the Dexter plant of the Pennsylvania-Dixie Cement Corporation at Nazareth, Pa.

There will also be erected a bucket shed, 50 by 100 by 10 feet, having concrete foundations, floors and roof. The walls will be of portland cement stucco on Hyrib metal lath.

Penn Dixie Holds Safety Meetings

Plants 4, 5 and 6, located at Nazareth, Pa., of the Pennsylvania-Dixie Cement Corporation, recently held their annual safety meetings.

Mr. Ritter, of the State Workman's Insurance Fund; M. Fortuin, general manager; W. D. Roth, general superintendent, and R. B. Fortuin, assistant to the general manager, were the speakers. They reported on the accident records and told of the fire prevention work which is being carried on at the present time.

Plans were discussed for a safety campaign for 1928 and mention was made of the Portland Cement Association trophy which is to be awarded to the plant with no lost-time accidents during the year.

Lehigh Plants Evergreens

The Lehigh Portland Cement Company grounds at Union Bridge, Maryland, have been embellished by the planting of evergreens about the office buildings.

With the Manufacturers

NOTES FROM THE FIELD

Assistant District Manager

Mr. D. A. Cheyette, who has had experience in the selling of crushing and mining machinery, having represented Kennedy-Van Saun Manufacturing & Engineering Co., for the past twelve years, has entered the employ of the *Traylor Engineering & Manufacturing Co.*, New York City, in the capacity of assistant to District Manager R. R. Shafter.

A-D Speed Reducers

The Albaugh-Dover Manufacturing Company, Chicago, Illinois, has issued an 18-page speed reducer booklet known as "Bulletin A."

Contained in the publication are illustrations of types of reducers, dimensions and section views.

Cutler-Hammer Offices

Since January 1st, the Pacific coast offices of the *Cutler-Hammer Mfg. Co.*, Milwaukee, Wisconsin, manufacturers of electric motor control apparatus and allied lines, will be handled by their own Pacific coast sales offices, at 970 Folsom Street, San Francisco; 229 Boyd Street, Los Angeles; and 2203 First Avenue, South, Seattle.

The new sales district will be in charge of *Fred H. Oberschmidt*, a member of the *Cutler-Hammer* organization for over fifteen years. Associated with Mr. Oberschmidt at the San Francisco headquarters office will be *Mr. A. A. Tuffert* and *George P. Stone*. *Thomas N. Bristow* will be in charge of the Seattle office and *Edward G. Nelson* of the Los Angeles office.

Complete stocks of standard items in the *Cutler-Hammer* line will be carried at all Pacific coast offices. Special arrangements have been completed whereby production and shipment of special equipment for the coast, built in the *Cutler-Hammer* factories at Milwaukee and New York, will be given preferred attention.

G. E. Changes

Mr. H. F. T. Erben, assistant vice president of the *General Electric Company*, retired on January 1, 1928, after more than 40 years of service with the company. At the time of his retirement he was also vice chairman of the *General Electric Manufacturing committee.*

B. L. Delack has been appointed manager of the Schenectady plant of the *General Electric Company*. *E. A. Wagner* has been appointed manager of the Pittsfield, Mass., plant.

Sales organization changes include the appointment of *C. N. Gregory* as manager of the New Haven, Conn., office, succeeding *Frederic Cutts*, and *Mr. R. B. Ransom* has been appointed resident agent in charge of the Hartford office, succeeding *Mr. Gregory*.

New Bates Factory

In developing its southern territory, the *Bates Valve Bag Corporation*, with main office in Chicago, Illinois, has begun the erection of a factory in Birmingham, Alabama. The *Bates* multi-wall paper bag will be manufactured there.

As an initial unit, the *Bates Valve Bag Corporation* will erect a factory approximately 60 by 250 ft., and one story in height. This factory will also contain space for the warehousing of other products that it manufactures, including filling machines, wire ties for closing cotton and jute bags and an adequate supply of spare parts.

Jones Officers

At the annual directors meeting of the *W. A. Jones Foundry & Machine Company* of Chicago, held January 30th, 1928, the following officers were elected: *Warren G. Jones*, president; *George W. Page*, vice-president; *Wm. F. Coleman*, treasurer; *John A. Sizer*, secretary.

Warren G. Jones continues as president and general manager.

G. W. Page, who assumes the position of vice-president, has been with the company for almost 30 years.

Wm. F. Coleman, the new treasurer, is an old employee of the company and also holds the position of general superintendent.

J. A. Sizer succeeds himself as secretary. He, too, has been with the company for many years in the capacity of office manager.

The board of directors consists of *W. G. Jones, G. W. Page, J. A. Sizer, W. F. Coleman*, and *W. A. Jones.*

Botfield Representatives

The Botfield Refractories Co., Philadelphia, Pa., announces the appointment of *Ires Prosses* as its southeastern representative. *Mr. Prosser's* territory will embrace the entire Southeast from North Carolina to San Antonio, Texas. His headquarters will be Atlanta, Georgia.

Timken Expands

An announcement has recently been made by the officials of *the Timken Roller Bearing Company* that an expenditure of $4,000,000 to be devoted to increasing the production facilities of the company has been authorized for the coming year. The greater part of this expansion program concerns the company's plant at Canton, where both the steel mill and the bearing manufacturing plant proper will be considerably enlarged.

A new substation of greater kilowatt capacity will be built for supplying electric power for both the steel mill and the factory.

Link-Belt Appointments

Link-Belt Company has announced the appointment of four vice presidents, as follows:

George P. Torrence, with headquarters at Indianapolis, in general charge of Indianapolis operations and sales of Indianapolis plant products; *George L. Morehead*, Philadelphia, in charge of eastern operations and sales; *Frank B. Caldwell*, in charge of the Chicago plant and sales offices tributary thereto; *W. C. Carter*, in general charge of production at all plants, with headquarters at the general office of the company, 910 S. Michigan Ave., Chicago.

INDUSTRIAL LITERATURE

Paper Bag Folder

A four-page folder published by the *Bates Valve Bag Company*, Chicago, Illinois, tells of the advantages of *Multi-Wall* paper bags. Listed are names of cement companies using the bags.

G-E Publications

The General Electric Company, Schenectady, New York, has published a series of 8 by 10½, 4-page loose leaflets on the following products: Arc welder, hand starting compensators, constant-speed direct-current motors, low-speed synchronous motors, low-speed direct-current generators, oil fuse cutouts, protective panels, selector supervisory equipment, magnetic switch, GTE motors. Several of these supersede earlier publications.

Mill Equipment

Jeffrey Standardizes Belt Conveyors

Attention has been called by the Jeffrey Manufacturing Company, Chicago, to the recent standardization of its belt carriers for conveyors so that the same size stands and bases may be used with any of the three types of pulleys including the plain bearing, the bronze bushed and the roller bearing.

The pulleys are similar in that they are made with open ends, with three arms joining the hub and the roller, in place of solid ends, and, the free carbon in the grey iron is claimed to act as a rust repellent.

Pulleys with plain or bronze bushed bearings have hubs specially cored out to form large recessed grease pockets connecting with the Alemite pressure lubrication fittings at the end of the hollow shaft. These grease pockets are designed to be useful on long belt conveyors where a few pulleys are often skipped over or neglected at the regular oiling.

Another advantage claimed for the grease pocket is that grease does not harden in the feed holes as in pulleys where the grease is fed directly to the bearings. Plain bearing pulleys that are worn may be drilled out and put back into service with new bronze bushings.

For belt conveyors installed to carry materials that are severe on metal bearings, coke breeze, for example, Jeffrey makes a roller-bearing pulley, pressure greased, fitted and five times grease-sealed.

The labyrinth construction provides five pairs of closely-joined metal surfaces keeping powdery abrasives from reaching the bearings. In addition, grease under pressure from the inside flows all dirt outward.

New Fawcus Worm Gear Speed Reducer

The Fawcus Machine Co., Pittsburgh, Pa., has recently placed on the market a new patented type of worm reduction gear especially designed to give high ratios of speed reduction.

The essentials in design and construction are uniform throughout the whole line, being substantially as follows. The driving motor is connected by means of a flexible coupling to a helical pinion which drives a helical gear mounted on an extension of the worm shaft. This gear drives the worm, which in turn drives the worm wheel. By this interposing the helical gear train between the motor and the worm shaft it is possible to hold the tooth angle on the latter within the limits that will give the best efficiency, and still obtain a high reduction ratio.

Another feature that aids in obtaining a high degree of efficiency is the fact that all the various shafts are mounted in Timken bearings. The helical pinion shaft mounting comprises two bearings, one at each end of the shaft, and the same arrangement is used for the worm wheel.

New Instrument and Control Switches

The Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has recently put on the market a new type of switch used for connecting any instrument or group of instruments selectively to various circuits as may be required for metering, synchronizing, or for other switching functions. These switches are of the rotary type. They are especially adapted to mounting in small space, and present a uniform appearance which will harmonize with instruments and similar apparatus on high-grade switchboards, according to the manufacturers.

The turning of the switch handle operates a shaft on which are mounted various contact-making segments. These segments make or break contact with stationary fingers supported on an insulated base. This base is a part of the supporting structure of the switch with suitable top and sides serving to completely enclose the switch parts, and to complete the switch structure.

This switch may be mounted on any commercial thickness of panel. Its terminal board is such as to facilitate any of the accepted methods of switchboard panel wiring. All terminals are numbered, and in making connection the number of the stud should correspond to the number given in the wiring diagram. A Micarta sliding cover on each side makes the housing dust-tight. These covers are easily removable to allow access to all parts. All internal metal parts are nickel-plated.

These switches are made in six standard lengths. The many combinations required are assembled from a relatively small number of standard segments and insulating arc-resisting spacers. All switches are insulated for 600-volt service a. c. or d. c. The contacts will carry 10 amperes continuously and will open 5 amperes under normal conditions.

Switches of this type can be mounted 3 inches apart horizontally and 5¼ inches vertically between center lines.

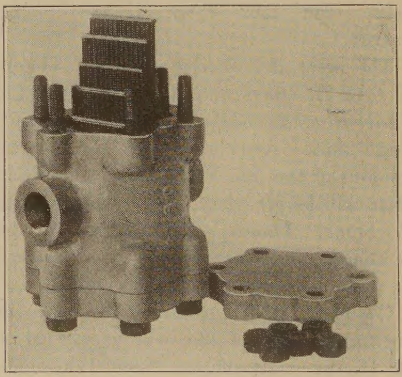
Line Start Induction Motors

A line of squirrel-cage induction motors suitable for starting on full line voltage is being placed on the market by Allis-Chalmers Manufacturing Company, Milwaukee, Wis. These motors are normal torque, high reactance machines and it is said will not draw starting current in excess of the limits recommended by the Electrical Apparatus Committee of the National Electric Light Association.

They are built in ratings 7½ to 30 h.p., 600 to 3600 r.p.m., low voltage, and are available with either sleeve or roller bearings. Features of Allis-Chalmers construction as employed in squirrel-cage motors are maintained in this new line. A magnetic switch with push-button control is claimed to be the only starting equipment required.

Pipe Line Tracyfier Enters Market

Using the same principles that have been employed in the Tracyfier, a smaller purifier known as the Pipe Line Tracyfier has been developed for use in several sizes of air, steam, or gas lines up to 3 inches.



In saturated steam lines it removes moisture from the steam, delivering standard specification steam, free from solids, both soluble and insoluble. Samples of condensed steam are said to show no more than nine parts total solids per million. Standard specification steam is free from all moisture. Throttling calorimeter tests at all times show 100 per cent dry steam, plus or minus not more than .2 of 1 per cent, based on the determined normal of the calorimeter. The permitted variation of plus or minus .2 of 1 per cent is the tolerance for unavoidable variations in radiation and thermodynamic changes.

The Pipe Line Tracyfier is made and sold by Andrews-Bradshaw Company, a division of Blaw-Knox Co., at Pittsburgh.

Putting Waste Heat to Work

Attractive savings may be effected by utilizing the heat *of waste gases for steam generation*

A LARGE and increasing number of industries require furnaces for the heat treatment of material during manufacturing processes. These furnaces may be fired by coal (on mechanical stokers or in pulverized form), by gas or oil. Usually, the heat treatment is such that the gases leave the cold end of the furnace at temperatures from 900° to 2000° Fahrenheit. The heat of these gases is commonly referred to as "waste heat," as they are discharged to the atmosphere and the sensible heat which they contain, above the temperature of the outside air, is wasted.

The recovery of this waste heat, from industrial processes, offers one of the most important opportunities for reducing operating costs. The idea of utilizing the heat of waste gases for steam generation, is very old. However, the intelligent design and application of waste heat boilers is comparatively new and dates from the first recognition of the fact that steam boilers for waste heat reclamation present an entirely different problem of design and application, than steam boilers for direct firing.

A steam generator, properly designed for the effective utilization of the high temperature gases of direct firing, provides for the transfer of a large proportion of the heat *by radiation.*

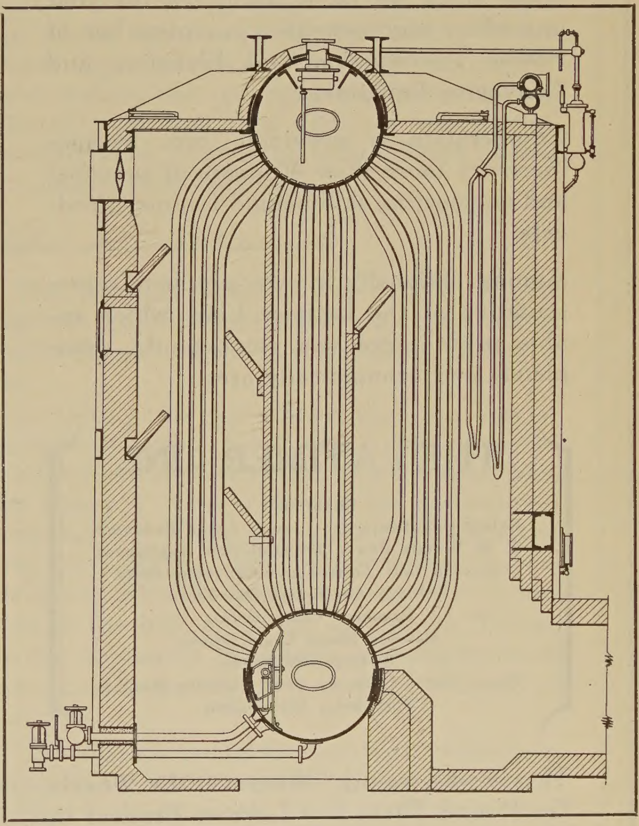
The gases from most waste heat sources are at temperatures considerably lower than those of direct fired boilers and practically all of the heat must be transferred *by convection.*

These lower average gas temperatures make it necessary to maintain relatively high gas velocities through the boiler in order to secure heat transfer rates which are most economical.

The waste gases from many industrial processes carry varying quantities of dust in suspension and ample provision must be made for cleaning the boiler surfaces and for removing the dust which settles out of the gas and accumulates in the boiler passes.

The Ladd two-drum waste heat type boiler shown in the illustration is particularly adaptable for waste heat reclamation and numerous installations have been made.

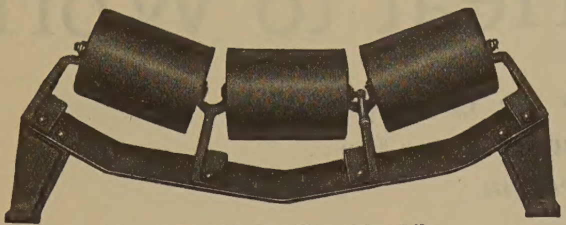
The proper proportioning of gas passages insures an efficient boiler without excessive draft loss.



Ladd Two-drum Boiler for Waste Heat Application

All parts of the boiler are readily accessible for inspection and repairs, and the ease with which the heating surfaces may be cleaned, both inside and outside, decreases boiler outage to a minimum.

An interesting folder on Waste Heat boilers is available. The Ladd Water Tube Boiler Company, 200 Madison Avenue, will gladly send you a copy upon request.



Rex-Stearns Timken Troughing Idler

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Service, because here in 18 floors of warehouse stock we have assembled for your immediate requirements a complete line of Power Transmission and Elevating and Conveying Equipment.

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Designers, Engineers, Manufacturers Elevating and Conveying and Power Transmission Equipment

(Continued from page 109)

responding values of ordinary portland cements. The following conclusions may be drawn:

1. The compressive strength of high strength portland cement cured in water for periods of 2 and 3 years is much higher than that of ordinary portland cement. The difference in lbs. per sq. in., even when average values alone are considered, remains practically the same at 2 years as at 7 days.

The variations in the trend of the strength curves are observed for both groups of cements at the same ages. A temporary flattening out of the curves is noticeable after 1-2 years.

2. The tensile strengths show a different trend. The differences in tensile strengths of the two groups of cements cured in water are highest during the first day. They tend to converge at 2 years, at which age the tensile strength of high strength portland cement is about 10 per cent higher than that of ordinary portland.

The higher the initial tensile strength, the sooner sets in a temporary flattening out or decline. Very high initial strengths produce this phenomenon within the period of standard testing procedure. The decline is later followed by a further rise. All cements show variations in tensile strength.

3. Combined curing results in variations of compressive and tensile strengths from 28 days to about 6 or 9 months, whereupon the compressive strength increases slightly, while the tensile strength increases markedly. The tensile strengths of combined curing are always above those of water curing. The compressive strengths exceed those of water curing after 2 or 3 months combined curing; only at the age of 5 years are the values nearly the same for both methods of curing. At 10 years the compressive strength is higher for combined curing than for water curing.

4. Pure air curing, i.e., 1 day in damp air, remainder under room temperature and moisture conditions results in compressive and tensile strengths lower than those of combined curing even for the more advanced ages. (Combined curing: 1 day in moist air, 6 days under water, remainder in air indoors). The trend of the strength curves is in general the same for air or combined curing.

Conclusions 3 and 4 apply to high strength portland cements as well as to ordinary portland cements.

Adjustable Dash Pot for Cement Testing

During the carrying out, at the Imperial Institute, South Kensington, London, England, of investigations on portland cement and on cement materials received from overseas, it has been found necessary to perform tests involving the determination of the depth to which a weighted plunger will sink into a neat cement paste.

When testing was commenced at the cement testing laboratory of the Imperial Institute in 1915, it was observed that when the plunger was lowered into the paste by hand, there was a tendency on the part of the operator to impede its fall slightly as the 6 mm. end point was approached, and, since different operators were engaged upon the same test, it appeared desirable to eliminate this personal factor and to secure uniformity in working by employing a mechanical device.

An adjustable dash pot, which is intended for attachment to the usual form of Vicat "needle" apparatus, has been designed at the Imperial Institute by A. T. Faircloth with the object of overcoming the above-mentioned error in testing, and insuring the rod of the Vicat "needle" being lowered under standard conditions.